

**VANDERBURGH COUNTY
SOIL AND WATER
CONSERVATION DISTRICT**

**BARR CREEK WATERSHED
POST-CONSTRUCTION MONITORING STUDY**



**V3 Companies
November 2005**

BARR CREEK WATERSHED POST CONSTRUCTION MONITORING STUDY

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1.0 EXECUTIVE SUMMARY

V3 Companies, Ltd (V3) has conducted the Barr Creek Watershed Post-Construction Monitoring Study for the Vanderburgh County Soil and Water Conservation District (SWCD). There are five sampling stations for evaluating macroinvertebrate communities, habitat and water quality parameters. This includes two stations on Barr Creek, two stations on Big Creek, and the reference station on Rush Creek. This study follows the guidelines suggested by the Indiana Department of Natural Resources (IDNR) Lake and River Enhancement (LARE) Program. This study was funded by the IDNR's LARE program. Only Stations 2 and 3 are along Barr Creek. Stations 2, 3 and 5 are downstream of the watershed drainage area's which had land use best management conservation practices implemented.

Land use best management conservation practices were implemented by the Vanderburgh and Posey County SWCDs to improve the Barr Creek watershed from 1993 through 1998. The land use best management conservation practices included: no-till conservation tillage, stormwater runoff diversions, cool season grass filter strips, pipe structure grade stabilization structures, a poured concrete toewall grade stabilization structure, rock rip-rap grade stabilization structures, newly created grass waterways, repaired grassed waterways, integrated crop management, pasture and hayland plantings, rock rip-rap streambank protection, tree plantings, waste management containment systems, and water and sediment control basins.

The 1994 Rapid Bioassessment of the Barr Creek and Big Creek Watersheds Using Benthic Macroinvertebrates attempted to establish baseline information within the watershed. V3 performed the 2004 post-land use treatment improvements evaluation in an attempt to evaluate the effectiveness of the land use best management conservation practices. V3 has made the best possible comparisons in the resulting data between the 2004 Barr Creek Watershed Final Water Quality Monitoring Study and the 1994 study. Macroinvertebrate monitoring and habitat evaluations were conducted using the methods provided by the U.S. Environmental Protection Agency. Habitat was also evaluated by using the Qualitative Habitat Evaluation Index (QHEI). Water quality measurements were taken in the field with water quality meters.

The comparative interpretation between the 1994 and 2004 water chemistry data was limited due to the differences in sampling seasons and limited water quality parameters. Variation in water temperature affects the other water quality measurements. Water temperature readings from summer 1994 were as high as 97⁰F in Barr Creek and 95⁰F in Big Creek. The USEPA STORET database from station #03378550, near Wadesville on Big Creek, approximately five miles downstream of Station 5, lists mean water temperature at 50⁰F and the upper 85th percentile as 72⁰F. If field measurements of water temperature from 1994 were accurate, it is representative of an extreme condition and should have been cause enough for re-scheduling the sampling effort. It was concluded that attempting to duplicate the 1994 sampling seasons was not in the best interest of meaningful water quality results. V3 performed the 2004 study abiding by the suggested spring and fall sampling seasons as a result of discussions with the IDNR and the Vanderburgh County SWCD. Regrettably, the LARE office was not consulted in this determination. It is important to collect post-treatment samples as close as possible to the dates of when the pre-treatment survey was completed (IDNR, 2005). However, local IDNR staff believed that flowing water may not occur in Barr Creek during summer and winter months.

The habitat comparison between the 1994 and 2004 studies demonstrated that habitat at the two Big Creek stations and the furthest downstream station on Barr Creek degradation from regional expectation, as represented by the reference stations. The qualitative assessment which most significantly contributed the quantitative value representing degradation within the Habitat evaluation parameters is: Bottom Substrate/Available Cover; Pool/Riffle, Run/Bend Ratio; and Channel Alteration. All three of these stations have unstable silt bottoms, very poor representation of riffles, and are significantly channelized.

The biological evaluation of macroinvertebrate communities from 1994 and 2004 involved discrepancies in sampling protocols and sampling seasons. The ability to make valid comparisons between the 1994 and 2004 studies is compromised by the use of inconsistent field methods. V3 followed the multihabitat approach provided in the USEPA Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers, Periphyton, Benthic Macroinvertebrates and Fish, Second Edition, publication number EPA 841-B-99-002. The 1994 survey and the preference of the LARE program is to follow the single habitat approach as described within the above mentioned USEPA publication or the RBPIII protocol as it is described in the USEPA Rapid Bioassessment Protocols for Use in Streams and Rivers, Benthic Macroinvertebrates and Fish, publication number EPA/440/4-89/001. It is important for subsequent evaluations and comparisons to be aware of these data collection differences.

The comparison between the study results from the summer shortly after to the spring more than ten years after the land use best management conservation practices were implemented show an improved biological condition at Station 2 on Barr Creek (Slight to None) and at Stations 4 and 5 on Big Creek (Moderate to Slight). Comparison between the winter shortly after to the fall more than ten years after show an improved biological condition at Station 2, where the rating improved from Slight Impairment to No Impairment. All other impairment category ranking remained unchanged.

The interpretation of biological impairment levels as they relate to the regional achievable potential represented by comparison with the reference station has limitations. The 1994 and 2004 studies lack a consistence in sampling season and sampling methodology. This limits an interpretation of the data as to whether the land use best management conservation practices demonstrated an improvement within the watershed. Rating of the sampling stations in comparison to the reference stations, the conditions of the macroinvertebrate communities either remains constant or it improves from 1994 to 2004. Without an improved condition correlation in habitat or water quality to add support to the improved condition in the interpretation of the macroinvertebrate communities, the confidence in a statement of the health of the watershed having demonstrated improvements is unsupported.

The benthic macroinvertebrate impairment categories by sampling stations through a comparison of 1994 to the 1994 reference station and 2004 sampling stations to the corresponding 2004 reference station either remained the same or showed improvements. Three of the four sampling stations from 1994 to 2004 demonstrated a degraded habitat condition. This report concludes that the measures taken to install no-till conservation tillage, stormwater runoff diversions, cool season grass filter strips, pipe structure grade stabilization structures, a poured concrete toewall grade stabilization structure, rock rip-rap grade stabilization structures, newly created grass waterways, repaired grassed waterways, integrated crop management, pasture and hayland plantings, rock rip-rap streambank protection, tree plantings, waste management containment

systems, and water and sediment control basins may have been effective in improving the quality of some attributes within the Barr Creek watershed. The habitats of Barr and Big Creeks require additional attention.

Land use best management conservation practices have been implemented within the 10,000 acres of Barr Creek's watershed. We recommend the continued implementation of habitat focused watershed improvement measures within Barr Creek's watershed, especially within the portions of Posey County. We recommend that similar measures in the upstream rural and agricultural areas of the 40,000 acres of Big Creek's watershed be implemented. Complications may arise as Big Creek's watershed spans Posey, Gibson and Vanderburgh counties, however, the improvements in Barr Creek demonstrate the validity of implementing best management land use conservation practices.

2.0 ACKNOWLEDGEMENTS

V3 would like to acknowledge the contributions the Vanderburgh and Posey County SWCD's for implementing the land use best management conservation practices. We would like to acknowledge Amy Steeples and Ronnie Boehm (both with IDNR at the time of V3's survey) for their assistance with historical data collection and field sampling efforts. We would also like to acknowledge Cecil Rich (IDNR, LARE Program Biologist) for his review and comments.

3.0 INTRODUCTION

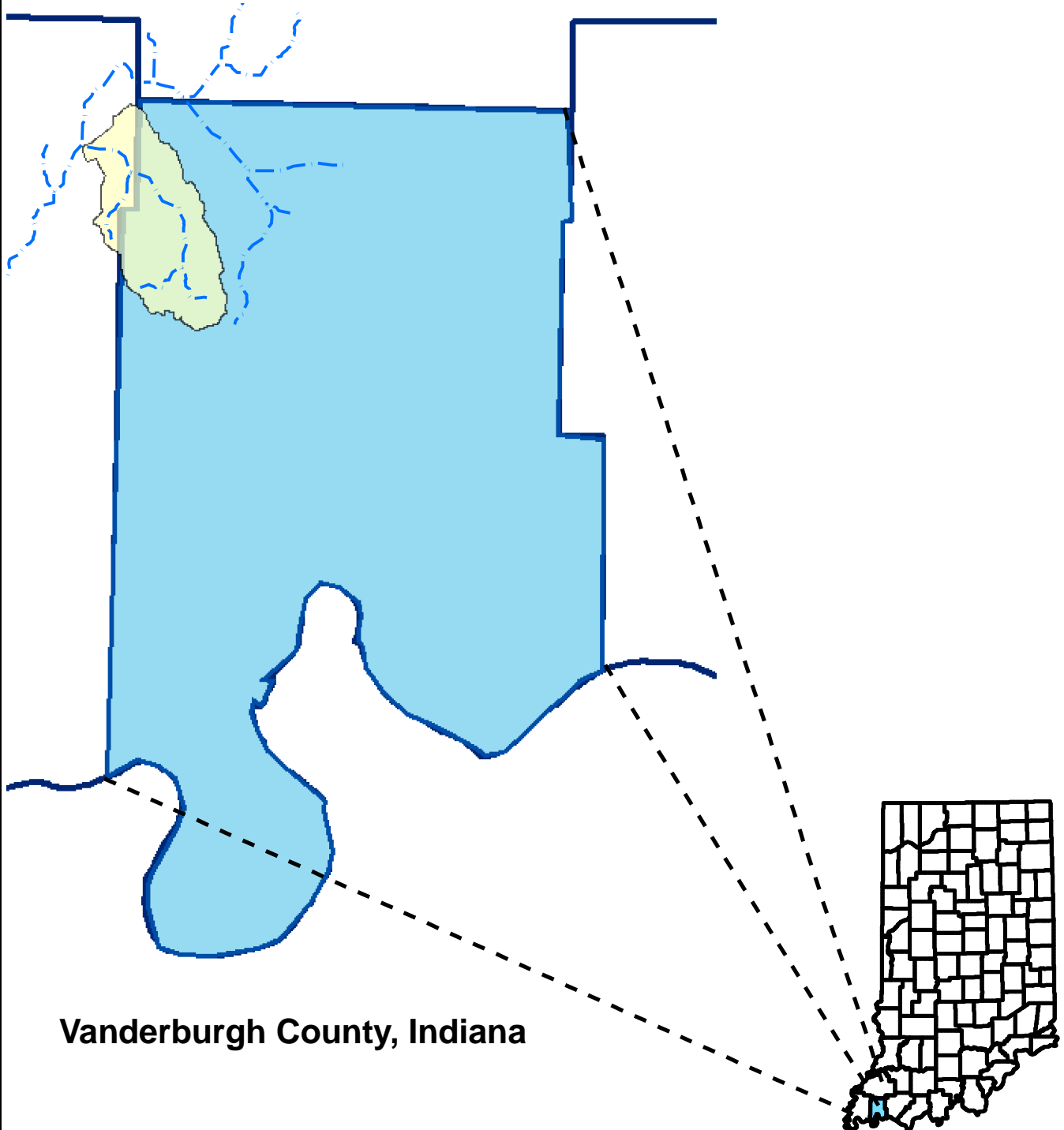
V3 has provided technical services to the Vanderburgh County SWCD in conducting the Barr Creek Watershed Post-Construction Monitoring Study in Vanderburgh and Posey Counties, Indiana. The Vanderburgh County SWCD has performed several land use conservation practices throughout the watershed to improve water quality conditions. Comparisons are valuable between the pre-treatment and post-treatment studies to evaluate the effectiveness of the land use conservation practices that were implemented. The majority of the 8,998.6 acre Barr Creek watershed (see Exhibit I) is within Vanderburgh County, with the downstream most northwest portions extending into Posey County. Rush Creek, in Posey County, was used as a reference stream in the comparative analysis of this study. The comparison of sampling stations to the reference station negates a negative climatic event's impact to the station (such as draught) from invalidating the sampling effort, as the reference station is exposed to the same climate. The reference station represents what the sampling station achievable potential. This study follows the guidelines suggested by the IDNR LARE Program. The LARE program provided the funding to carry out the post-treatment monitoring study.

There are five identified sampling stations that were monitored in the spring (mid-April to mid-May) and in the fall (mid-September to mid-October). Station 1 is the reference site and is located on Rush Creek, in Posey County. Sampling Stations 2 and 3 are within the Barr Creek watershed located in both Vanderburgh and Posey Counties. Stations 4 and 5 are within the Big Creek watershed located in Posey County. All sampling stations are shown on Exhibit II.


The Vanderburgh County SWCD has performed several land use conservation practices throughout the watershed to improve water quality conditions. Measurements of the proportions of land using conservation tillage practices were not available for comparison throughout the years since the previous monitoring study was conducted. Locations of Barr Creek's best management practices are shown in Exhibit III and include the following:

- 38.2 acres of no-till Conservation Tillage
- 2,250 linear feet of Diversion
- 1.5 acres of cool season grass Filter Strips
- 17 facilities with pipe structure Grade Stabilizations
- 1 facility with poured concrete toewall Grade Stabilization
- 5 facilities with rock rip-rap Grade Stabilizations
- 11,110 linear feet of Grassed Waterways
- 1,000 linear feet of Grassed Waterway repair
- 38.2 acres of Integrated Crop Management
- 15.5 acres of Pasture and Hayland Planting
- 326 linear feet of rock rip-rap Streambank Protection
- 0.5 acres of Tree Planting
- 4 facilities with Waste Management Containment Systems
- 107 facilities with Water and Sediment Control Basins

Barr Creek Watershed



Vanderburgh County, Indiana

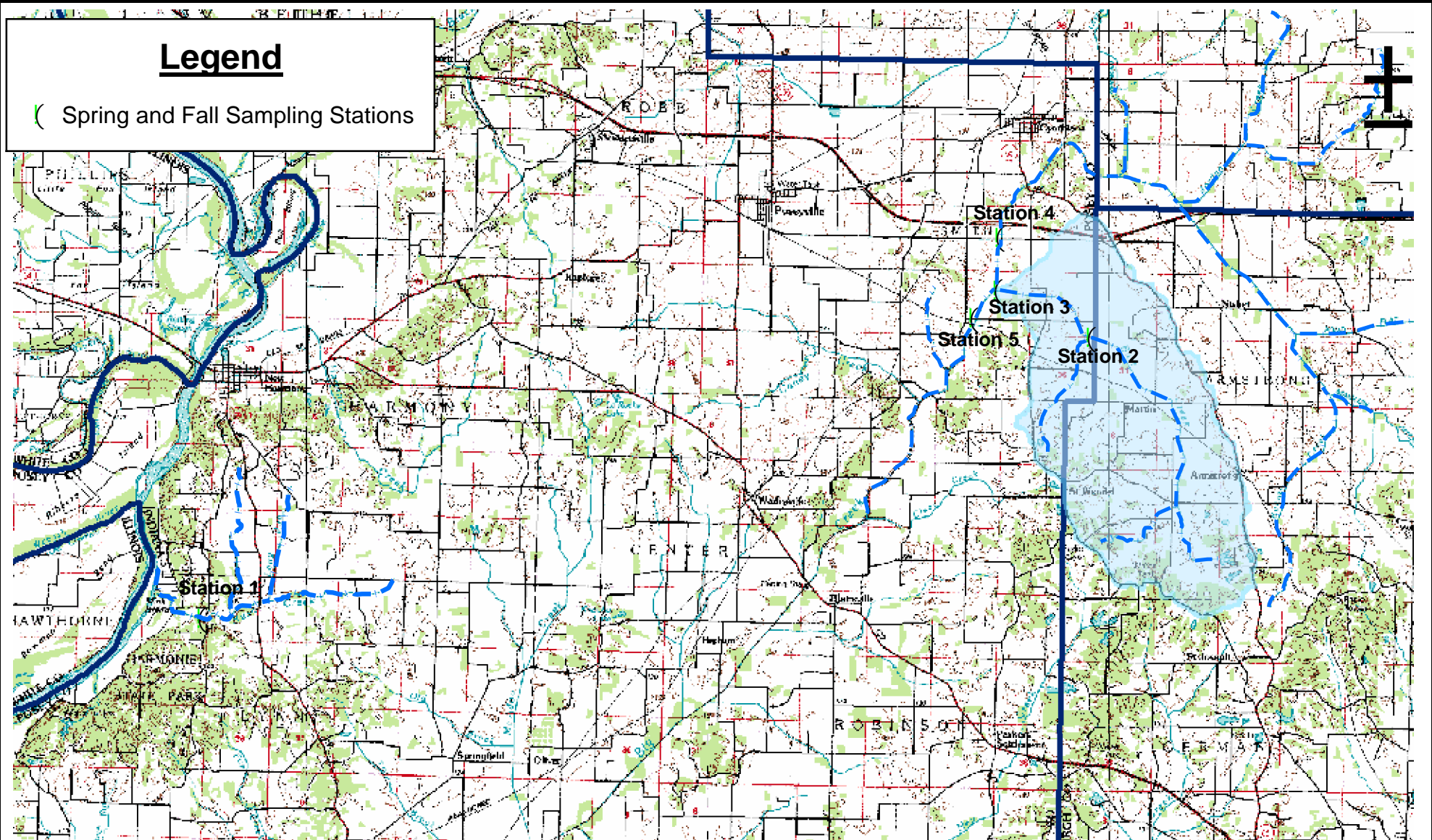
 Engineers Scientists Surveyors	TITLE: Project Vicinity Map		PROJECT: Post Construction Monitoring for Barr Creek		
	BASE LAYER: N/A		PROJECT NO. 04011	EXHIBIT: I	SHEET: 1 OF: 1
	CLIENT: Vanderburgh County Soil and Water Conservation District 12445 Highway 41 North Evansville, Indiana 47725		QUADRANGLE: N/A	DATE: 02-01-05	SCALE: NTS

7325 Janes Avenue, Suite 100
Woodridge, IL 60517
630.724.9200 voice
630.724.9202 fax
v3consultants.com

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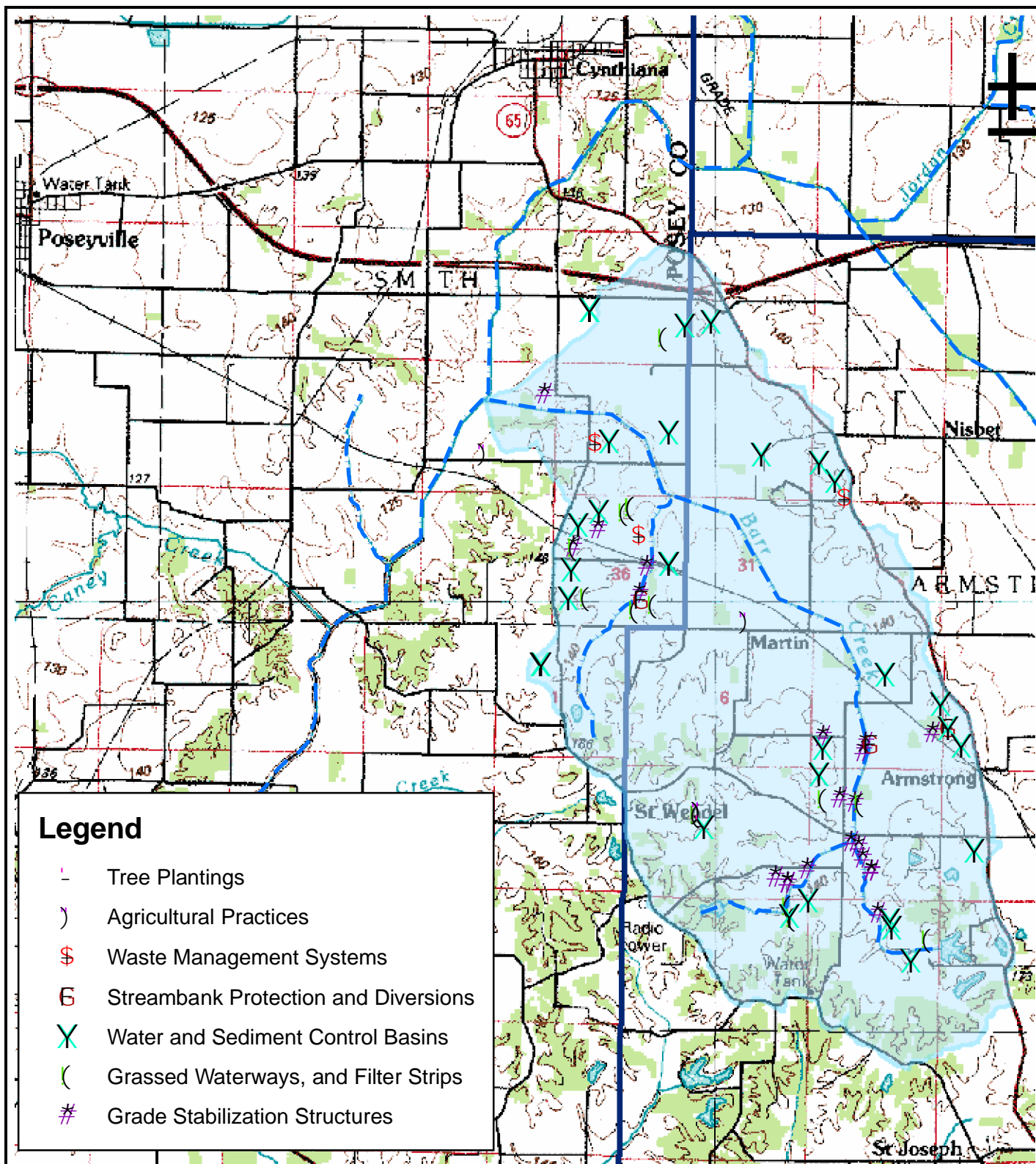
(Spring and Fall Sampling Stations




**Engineers
Scientists
Surveyors**

7325 Janes Avenue, Suite 100
Woodridge, IL 60517
630.724.9200 voice
630.724.9202 fax
v3consultants.com

TITLE: Sampling Stations		PROJECT: Post Construction Monitoring for Barr Creek		
BASE LAYER: USGS Topographic Map		PROJECT NO.: 04011	EXHIBIT: II	SHEET: 1 OF: 1
CLIENT: Vanderburgh County Soil and Water Conservation District 12445 Highway 41 North Evansville, Indiana 4		QUADRANGLE: N/A	DATE: 02-02-05	SCALE: NTS



 Engineers Scientists Surveyors	7325 Janes Avenue, Suite 100 Woodridge, IL 60517 630.724.9200 voice 630.724.9202 fax v3consultants.com	TITLE: Best Management Practices	PROJECT: Post Construction Monitoring for Barr Creek		
		BASE LAYER: USGS Topographic Map	PROJECT NO. 04011	EXHIBIT: III	SHEET: 1 OF: 1
		CLIENT: Vanderburgh County Soil and Water Conservation District 12445 Highway 41 North Evansville, Indiana 4	QUADRANGLE: N/A	DATE: 02-02-05	SCALE: NTS

In 2004, V3 performed the Post-Construction Monitoring Study in accordance with the guidelines suggested by the IDNR LARE Program. V3 also performed the spring and fall sampling efforts within the LARE Program's designated timeframes, and as a direct result from discussions with regional IDNR staff and Vanderburgh County SWCD employees. However, the study performed in 1994 did not perform sampling during these seasonal time frames, as the spring sampling (mid-April to mid-May) was performed in July, and the fall sampling (mid-September to mid-October) was performed in December. This seasonal sampling discrepancy will cause potential distortions within the comparative analysis. Performing the post-construction monitoring during the months of July and December would have allowed for more direct comparisons, however, it was the opinion of local professionals from the IDNR and SWCD that Barr Creek may not have flowing water during the summer and winter months in 2004. A decision was made to abide by the spring and fall sampling seasons for the reasons of having surface water within Barr Creek and to establish a 2004 data set within the prescribed sampling seasons for future comparisons. Admittedly, the drawback to this decision makes it difficult to perform direct comparisons between the 1994 study and the 2004 study.

The Barr Creek watershed is in a predominantly rural agricultural and is approximately 8,998.6 acres. Barr Creek terminates at its confluence with Big Creek. The 14-digit hydrologic unit code (HUC) for the Barr Creek subwatershed is 05120113110050. Big Creek was sampled in two different, but adjacent, subwatersheds. Station 4 is located on Big Creek upstream of the confluence with Barr Creek. The 14-digit HUC number for the upstream subwatershed on Big Creek is 05120113110040. Station 5 is located on Big Creek and is downstream of the confluence with Barr Creek. The 14-digit HUC number for the downstream subwatershed on Big Creek is 05120113110070. There are two sampling stations along Barr Creek (Stations 2 and 3) and two sampling stations along Big Creek (Stations 4 and 5). Station 3 was measured to be 285 feet upstream of the confluence between Barr and Big Creeks during the spring 2004 sampling effort. The 14-digit HUC number for the reference location on Rush Creek is 05120113100030. All of the studies sampling stations are described in Table 1, and shown in Exhibit II.

TABLE 1 –BARR CREEK WATERSHED, SAMPLING STATIONS

	Waterway	Location	Sampling Season	Watershed Area (acres)
Station 1	Rush Creek	Harmonie State Park	Both Seasons	5,900
Station 2	Barr Creek	County Line Road	Both Seasons	6,200
Station 3	Barr Creek	Upstream of Confluence w/Big Creek	Both Seasons	10,000
Station 4	Big Creek	Water Tank Road	Both Seasons	39,900
Station 5	Big Creek	Emge Road	Both Seasons	50,000

All of the stations were selected to provide interpretive data on the respective portions of the watershed. Station 1 is the off-site reference location and is located within the Harmonie State Park. Station 1 is intended to have a desirable stream condition that can represent what Barr and Big Creek's achievable potential with respect to biological, physical and chemical characteristics. The reference station (Station 1) is located on Rush Creek and has a similar upstream drainage area as the furthest upstream station on Barr Creek (Station 2). Station 2, 3 and 5 receive the watershed drainage within the areas where the land use best management conservation practices have been implemented. Station 4 acts as a benchmark, as none of the implemented land use best management conservation practices are within its watershed. Station 5 does not encompass much additional watershed area (100 acres), however, it does represent the blending of waters from both Barr and Big Creeks. Potential impacts occurring at Station 5 would be shown to be from outside of the Barr Creek watershed if similar impacts were recorded at Station 4.

4.0 METHODS

4.1 Biological Evaluation Methods

Macroinvertebrate monitoring followed the USEPA's Benthic Macroinvertebrate Protocol for the multihabitat approach. The multihabitat approach involves the systematic collection of benthic macroinvertebrates from all available instream habitats by kicking the substrate or jabbing with a dip net. A total of 20 jabs or kicks are taken from all major habitat types in the reach resulting in sampling approximately 3.1 m² of habitat. The collected organisms are sorted in the V3 laboratory and identified to the lowest practical taxon. The collection procedure provides representative macroinvertebrate fauna from all of the available instream habitats including riffle and run habitat types that provide representatives of scraper and filterer functional feeding groups, and Course Particulate Organic Matter (CPOM) such as detritus, leaves and sticks that provide representatives of the shredder functional feeding group.

Although the multihabitat approach is provided in the USEPA Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers, Periphyton, Benthic Macroinvertebrates and Fish, Second Edition, publication number EPA 841-B-99-002, the LARE program would have preferred that the study had followed the single habitat approach as described within that same publication or the RBPIII protocol as it is described in the USEPA Rapid Bioassessment Protocols for Use in Streams and Rivers, Benthic Macroinvertebrates and Fish, publication number EPA/440/4-89/001. The data from survey of the benthic macroinvertebrate community shortly after the implementation of the land use conservation practices would have been more readily compared to the data from this survey had the methodology been the same.

4.2 Physical Evaluation Methods

Habitat evaluation followed both the USEPA rapid and qualitative habitat assessment approach and the Ohio EPA Qualitative Habitat Evaluation Index (QHEI) habitat assessment approach. Neither of these evaluation methods were readily comparable to the 1994 study, however, they are made available in this study for future comparisons.

4.3 Chemical Evaluation Methods

Water quality analysis was measured in the field using an In-Situ Multi Parameter TROLL 9000, YSI Model 50B Dissolved Oxygen Meter, LaMotte 2020 Turbidimeter, and MARSH-McBIRNEY FLO-MATE Model 2000 Portable Flowmeter. V3 performed the water quality measurements for the following parameters: oxidation-reduction potential, temperature, conductivity, pH, dissolved oxygen, flow and turbidity. V3 did not collect water samples for water chemistry analysis in a laboratory as the previous investigation did not perform these analysis and the results would not have been able to be compared.

5.0 RESULTS

IDEM was contacted to collect available information from the Barr Creek watershed on water chemistry, fish tissue, fish communities and benthic macroinvertebrate communities. No information was available from the Barr Creek watershed (IDEM 2005a through 2005d).

5.1 Biological Evaluation Results

Appendix I contains the field and laboratory data sheets for the benthic macroinvertebrate communities. Appendix II contains the transmittal letter and photo-documentation from V3 to Purdue University, Department of Entomology which accompanied the thirty seven (37) voucher specimens of macroinvertebrates collected during the 2004 study, as well as the response letter from Dr. Arwin Provonsha of Purdue stating that all 37 macroinvertebrates are accurately identified. Table 2 lists the macroinvertebrates that were collected during the April 2004 sampling event at each of the five stations. Table 3 lists the macroinvertebrates that were collected during the October 2004 sampling event at each of the five stations.

Table 4 presents the spring assessment results for macroinvertebrates from both 1994 and 2004. Table 5 presents the fall macroinvertebrate data in the same way. In situations where parameters have shown an improvement from the baseline study, yellow shading has been added to the cells.

TABLE 2 – BENTHIC MACROINVERTEBRATE COLLECTED BY STATION, APRIL 2004

ORDER	FAMILY	GENUS	SPECIES	STATIONS				
				1	2	3	4	5
Nematomorpha								4
Hydracarina-Trombidiformes								1
Tubellaria	Planaria			3	3		3	
Pelecypoda	Corbiculidae	Corbicula	fluminea			3	9	
	Sphaeriidae			17	6			
Gastropoda	Lymnaeidae			1				
	Physidae			1	4	2	1	2
	Planorbidae						1	
Annelida	Hirudinea			3				
	Oligochaeta			4	6	1	12	3
Decapoda					1	1		
Amphipoda				25	10	9	1	4
Isopoda	Asellidae				5	1	2	
Ephemeroptera	Caenidae	Caenis		1	1	1	2	1
	Baetidae	Baetis		1	1		4	18
	Heptageniidae	Stenacron		1	1	1		
Coleoptera	Dytiscidae						1	
	Halplidae				17	1	8	
	Elmidae				1			4
	Hydrophiloidae	Tropisternus			1			
Trichoptera	Hydropsychidae			4			3	1
Hemiptera	Gerridae			1	1			
Odonata-Anisoptera	Corduliidae				4	9	1	1
Odonata-Zygoptera	Calopterygidae	Calopteryx		2			14	5
	Coenagrionidae			2	4		6	7
	Coenagrionidae	Argia		2		1		
	Coenagrionidae	Engallagma				4		
Diptera	Blood-red Chironomidae			15	24	18	9	5
	Other Chironomidae			11	6	36	21	38
	Simuliidae			3	2	12	2	6
	Tipulidae			3	1			
	Tabanidae				1			

TABLE 3 – BENTHIC MACROINVERTEBRATE COLLECTED BY STATION, OCTOBER 2004

ORDER	FAMILY	GENUS	SPECIES	STATIONS				
				1	2	3	4	5
Nematomorpha						3		
Tubellaria	Planaria					3	1	2
Pelecypoda	Corbiculidae	Corbicula	fluminea		7		6	2
	Sphaeriidae			6				
Gastropoda	Lymnaeidae			1			1	6
	Physidae				13	15	1	3
Annelida	Hirudinea			1				1
	Oligochaeta				23		10	4
Amphipoda				3	2			
Isopoda	Asellidae			2				
Ephemeroptera	Caenidae	Caenis					3	5
	Baetidae	Baetis		12	4	7		
Coleoptera	Dytiscidae						2	4
	Gyrinidae					3		2
	Gyrinidae	Dineutus				1		
	Halplidae				1		3	2
	Elmidae				8	4		9
	Hydrophiloidae	Tropisternus			1	9		
Trichoptera	Hydropsychidae			13				
Hemiptera	Belostomatidae							1
	Corixidae				1	3		3
	Gerridae						5	2
Odonata- Anisoptera	Corduliidae				5	6	1	
Odonata- Zygoptera	Calopterygidae	Calopteryx		2				
	Coenagrionidae					34		14
	Coenagrionidae	Argia			16		14	2
	Coenagrionidae	Engallagma		3	14			10
Diptera	Blood-red Chironomidae			3	3	1	27	13
	Other Chironomidae			8		6	22	15
	Culicidae			1	2	2	4	
	Simuliidae			33				
	Tipulidae			12		3		

TABLE 4 – BENTHIC MACROINVERTEBRATE RESULTS, JULY 1994 AND APRIL 2004

Parameter	Station 1		Station 2		Station 3		Station 4		Station 5	
	1994	2004	1994	2004	1994	2004	1994	2004	1994	2004
Total Number of Taxa	16	19	14	21	12	15	12	18	11	15
Total Number of EPT Taxa	3	4	3	3	2	2	4	3	3	3
Percent Contribution of Dominant Taxa	24	25	54	24	59	36	32	21	41	38
Ratio of EPT/Chironomidae	1.7	0.27	8.9	0.1	1.6	0.1	0.6	0.3	0.07	0.47
Modified Biotic Index	6.9	5.9	7.3	6.6	8.4	6.2	7.4	5.4	7.3	5.2
Ratio of Scraper/Filterer	0.9	0.13	0.3	0.63	10	0.2	0.13	0.14	1.5	0.29
Ratio of Shredder/Nonshredder	14	0.25	0	0.15	0	0.1	0	0.03	0	0.04
Community Similarity - Community Loss	0.0	0.0	0.3	0.24	0.7	0.67	0.5	0.39	0.4	0.47
Community Similarity - Jaccard Coefficient	-	1	-	0.54	-	0.36	-	0.48	-	0.48
Number of Individuals Evaluated	100	100	100	100	100	100	100	100	100	100

Cells that are shaded yellow have improved from 1994 to 2004.

TABLE 5 – BENTHIC MACROINVERTEBRATE RESULTS, DECEMBER 1994 AND OCTOBER 2004

Parameter	Station 1		Station 2		Station 3		Station 4		Station 5	
	1994	2004	1994	2004	1994	2004	1994	2004	1994	2004
Total Number of Taxa	16	14	9	14	15	15	16	14	17	19
Total Number of EPT Taxa	6	2	1	1	1	1	2	1	2	1
Percent Contribution of Dominant Taxa	49	33	73	23	57	34	23	27	18	15
Ratio of EPT/Chironomidae	2.2	2.27	18	1.33	5.7	1.00	6.0	0.06	0.54	0.18
Modified Biotic Index	7.3	5.3	4.3	6.2	4.9	6.0	6.9	6.3	7.4	6.4
Ratio of Scraper/Filterer	0.13	0.02	0.5	1.86	2.0	15/0	0.06	0.33	0.5	4.5
Ratio of Shredder/Nonshredder	69	0.05	84	0.04	58	0.02	0	0.04	6	0
Community Similarity - Community Loss	0.0	0.0	1.1	0.64	0.5	0.6	0.4	0.71	0.5	0.47
Community Similarity - Jaccard Coefficient	-	1	-	0.22	-	0.21	-	0.17	-	0.18
Number of Individuals Evaluated	100	100	100	100	100	100	100	100	100	100

Cells that are shaded yellow have improved from 1994 to 2004.

The improvements to Station 4 indicate that the conditions in Big Creek have improved, which is unrelated to the measures that this study is attempting to evaluate. This implies that the improved condition to Station 5 is more than likely attributed to improvements within Big Creek, as the majority of the water originates from the Big Creek watershed.

The summer 1994 study reports 54 of 100 organisms collected at Station 2 were caddisflies. No caddisflies were collected at Station 2 during the winter 1994 study and no caddisflies were collected during the spring or fall 2004 study. It is postulated that sampling bias, seasonal sampling differences, misidentification or habitat degradation is responsible for this tremendously high and unrepeatable value.

The 1994 study reports that 73 of 100 organisms collected at Station 2 during December were stoneflies. It also reports that 57 of 100 organisms collected at Station 3 during the same study were also stoneflies. This genus of stonefly (*Allocapnia* sp.) are winter hatching insects that imerge from a state of diapause (a period of physiologically enforced dormancy) in November. This enable the colonization of intermittent streams, streams with periodically low oxygen and periodically warm temperatures that are not favorable to other types of stoneflies. As the 2004 sampling timeframe did not follow the same seasonal timeframes of the 1994 study, direct comparisons are limited.

The biological condition scoring criteria for each benthic macroinvertebrates parameter assigns numeric values of 6 for nonimpaired, 4 for slightly impaired, 2 for moderately impaired, and 0 for severely impaired. The numeric values for the first eight rows of Tables 4 and 5 are then totaled and normalized so that the reference locations are equal to 100. Station scores are then compared to their reference stations and assigned biological condition categories based on percent comparison to the reference station score. These criteria are >83% for nonimpaired, 51-82% for slightly impaired, 18-50% for moderately impaired, and <17% for severely impaired. Tables 6 and 7 provide the results of these calculations. Exhibits IV (1994) and V (2004) show the spring impairment categories visually by stream reach on a map of the watershed. Similarly, Exhibits VII (1994) and VIII (2004) show the fall impairment categories. It should be noted that the visual depiction of the impairment categories on these exhibits is station based and not truly representative of the entire upstream stream segment as displayed. This is a convenient way of visually representing the data and is not intended to imply the entire upstream reach possesses a uniform macroinvertebrate community.

Exhibits VI and IX demonstrate the locations of the land use best management conservation practices as they are located within the watershed and are denoted by the 2004 biological condition scoring criteria. As mentioned above, the data is station specific and visual presentation is not intended to imply that the entire upstream reaches posses a uniform community.

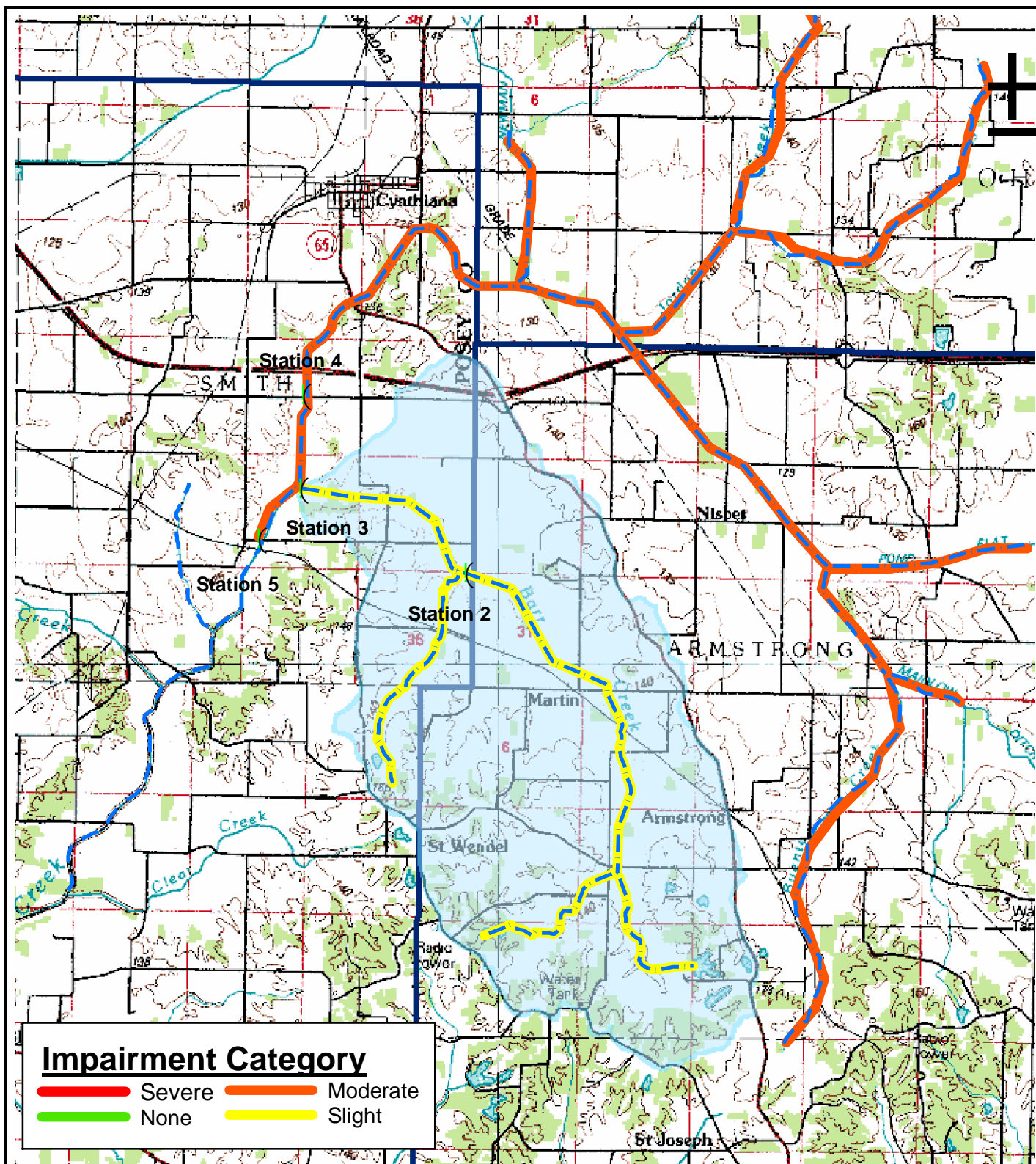
TABLE 6 – BENTHIC MACROINVERTEBRATE BIOLOGICAL CONDITION SCORING, JULY 1994 AND APRIL 2004


Parameter	Station 1		Station 2		Station 3		Station 4		Station 5	
	1994	2004	1994	2004	1994	2004	1994	2004	1994	2004
Total Number of Taxa	6	6	6	6	4	4	4	6	4	4
Total Number of EPT Taxa	6	6	6	2	4	0	6	2	6	2
Percent Contribution of Dominant Taxa	4	4	0	4	0	2	2	4	0	2
Ratio of EPT/Chironomidae	6	6	6	2	6	2	2	6	0	6
Modified Biotic Index	6	6	6	6	4	6	6	6	6	6
Ratio of Scraper/Filterer	6	6	4	6	6	6	0	6	0	6
Ratio of Shredder/Nonshredder	6	6	0	6	0	4	0	0	0	0
Community Similarity - Community Loss	6	6	6	6	4	4	4	6	6	6
Total	46	46	34	38	28	28	24	36	22	32
Percent of Reference	100	100	74	83	61	61	52	78	48	70
Impairment Category	None	None	Slight	None	Slight	Slight	Mod	Slight	Mod	Slight

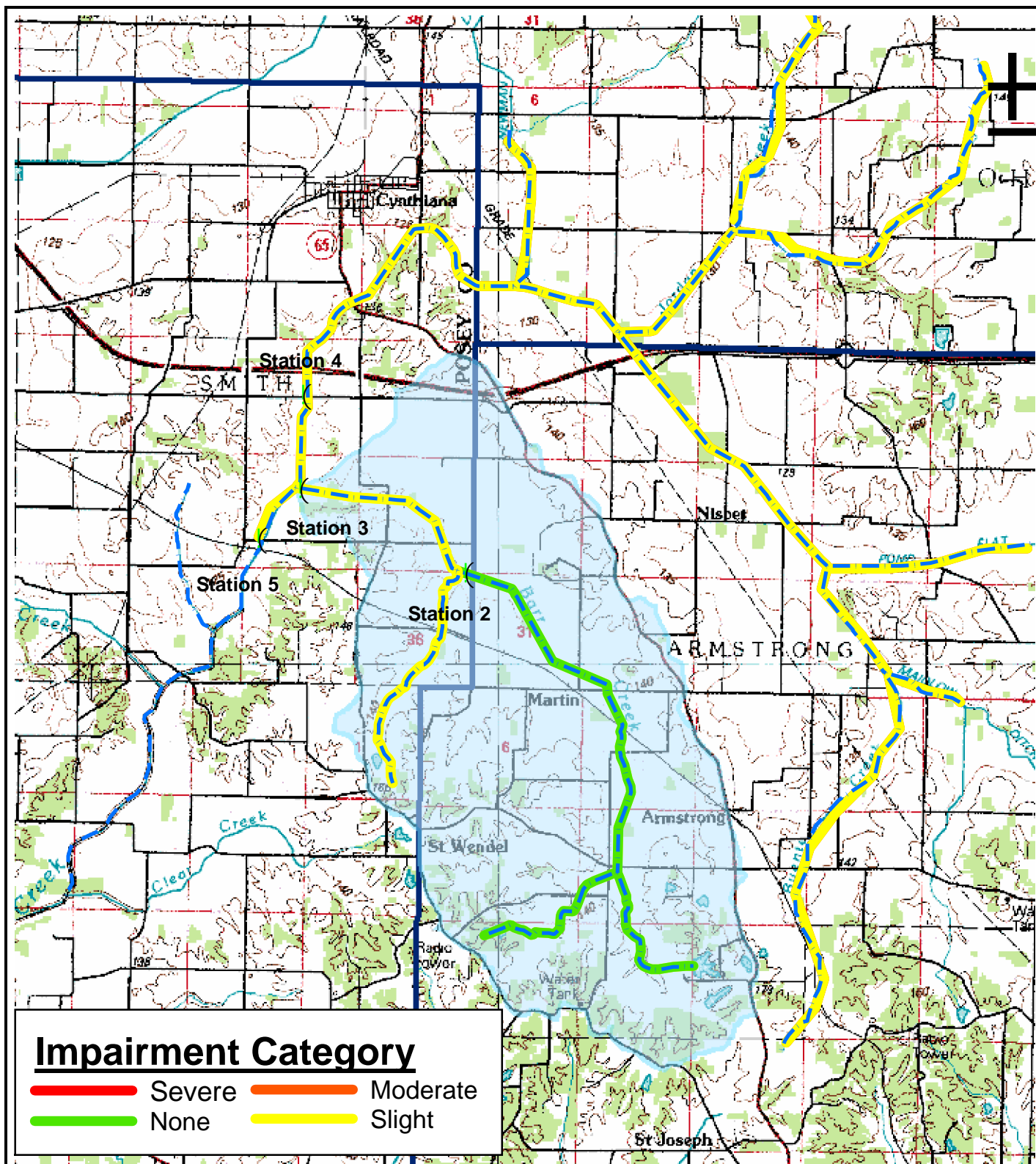
Cells that are shaded yellow have improved from 1994 to 2004.

Impairment Categories are defined as:

- greater than 83% of reference site = Nonimpaired
- 51% to 82% of reference site = Slightly Impaired
- 18% to 50% of reference site = Moderately Impaired
- less than 17% of reference site = Severely Impaired



 Engineers Scientists Surveyors	7325 Janes Avenue, Suite 100 Woodridge, IL 60517 630.724.9200 voice 630.724.9202 fax v3consultants.com		TITLE: 1994 Summer Impairment Categories			PROJECT: Post Construction Monitoring for Barr Creek		
	BASE LAYER: USGS Topographic Map		PROJECT NO. 04011		EXHIBIT: IV		SHEET: 1 OF: 1	
	CLIENT: Vanderburgh County Soil and Water Conservation District 12445 Highway 41 North Evansville, Indiana 4		QUADRANGLE: N/A		DATE: 02-02-05		SCALE: NTS	



Impairment Category

- | | |
|---|--|
| — Severe | — Moderate |
| — None | — Slight |

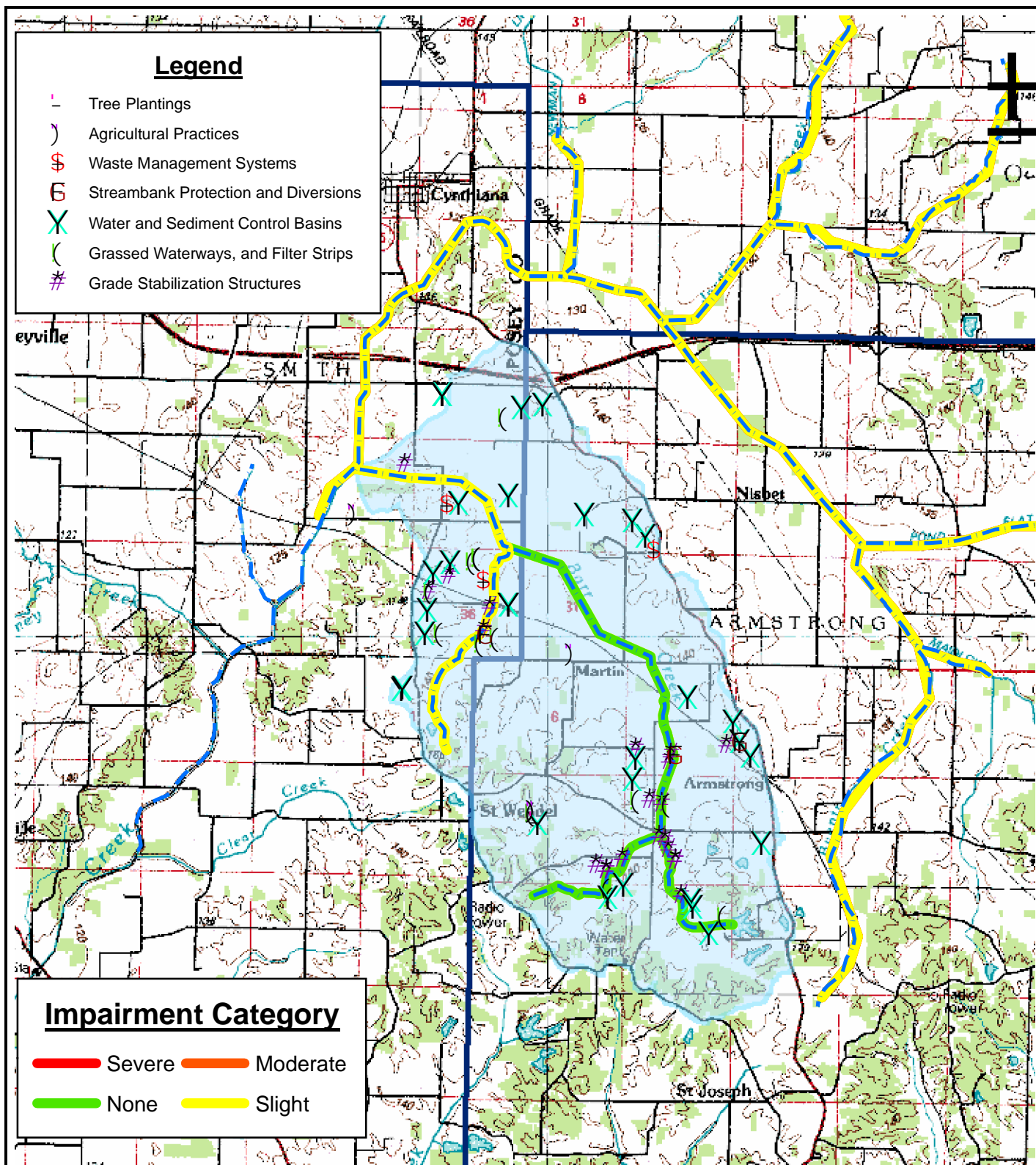


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7325 Janes Avenue, Suite 100
Woodridge, IL 60517
630.724.9200 voice
630.724.9202 fax
v3consultants.com

TITLE: 2004 Spring Impairment Categories	PROJECT: Post Construction Monitoring for Barr Creek		
	BASE LAYER: USGS Topographic Map	PROJECT NO. 04011	EXHIBIT: V
	CLIENT: Vanderburgh County Soil and Water Conservation District 12445 Highway 41 North Evansville, Indiana 4	QUADRANGLE: N/A	DATE: 02-02-05
			SHEET: 1 OF: 1
			SCALE: NTS

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 V3 Engineers Scientists Surveyors 7325 Janes Avenue, Suite 100 Woodridge, IL 60517 630.724.9200 voice 630.724.9202 fax v3consultants.com	TITLE: 2004 Spring Impairment Categories with BMP Locations		PROJECT: Post Construction Monitoring for Barr Creek		
	BASE LAYER: Indiana DNR Best Management Practices Exhibit		PROJECT NO. 04011	EXHIBIT: VI	SHEET: 1 OF: 1
	CLIENT: Vanderburgh County Soil and Water Conservation District 12445 Highway 41 North Evansville, Indiana 4		QUADRANGLE: N/A	DATE: 02-02-05	SCALE: NTS

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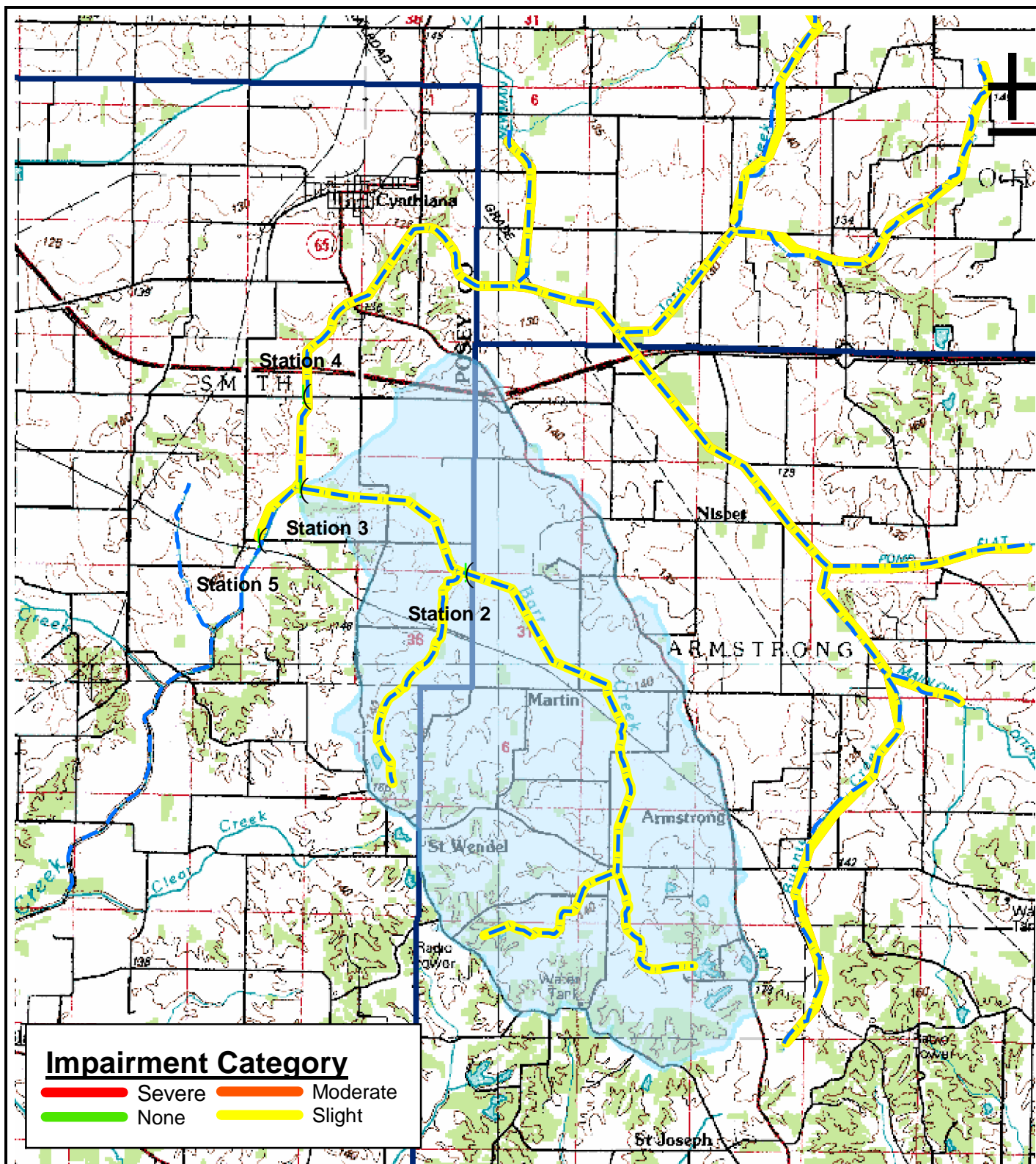
TABLE 7 – BENTHIC MACROINVERTEBRATE BIOLOGICAL CONDITION SCORING, DECEMBER 1994 AND OCTOBER 2004

Parameter	Station 1		Station 2		Station 3		Station 4		Station 5	
	1994	2004	1994	2004	1994	2004	1994	2004	1994	2004
Total Number of Taxa	6	6	4	6	6	6	6	6	6	6
Total Number of EPT Taxa	6	6	0	0	0	0	0	0	0	0
Percent Contribution of Dominant Taxa	0	2	0	4	0	2	4	4	6	6
Ratio of EPT/Chironomidae	6	6	6	4	6	2	6	0	2	0
Modified Biotic Index	6	6	6	6	6	6	6	4	6	4
Ratio of Scraper/Filterer	6	6	6	6	6	6	4	6	6	6
Ratio of Shredder/Nonshredder	6	6	6	6	6	6	0	6	0	0
Community Similarity - Community Loss	6	6	4	4	4	4	6	4	4	6
Total	42	44	32	36	34	32	32	30	30	28
Percent of Reference	100	100	76	86	81	73	76	68	71	64
Impairment Category	None	None	Slight	None	Slight	Slight	Slight	Slight	Slight	Slight

Cells that are shaded yellow have improved from 1999 to 2004.

Impairment Categories are defined as:

- greater than 83% of reference site = Nonimpaired
- 51% to 82% of reference site = Slightly Impaired
- 18% to 50% of reference site = Moderately Impaired
- less than 17% of reference site = Severely Impaired



Impairment Category

- | | |
|---|--|
| — Severe | — Moderate |
| — None | — Slight |

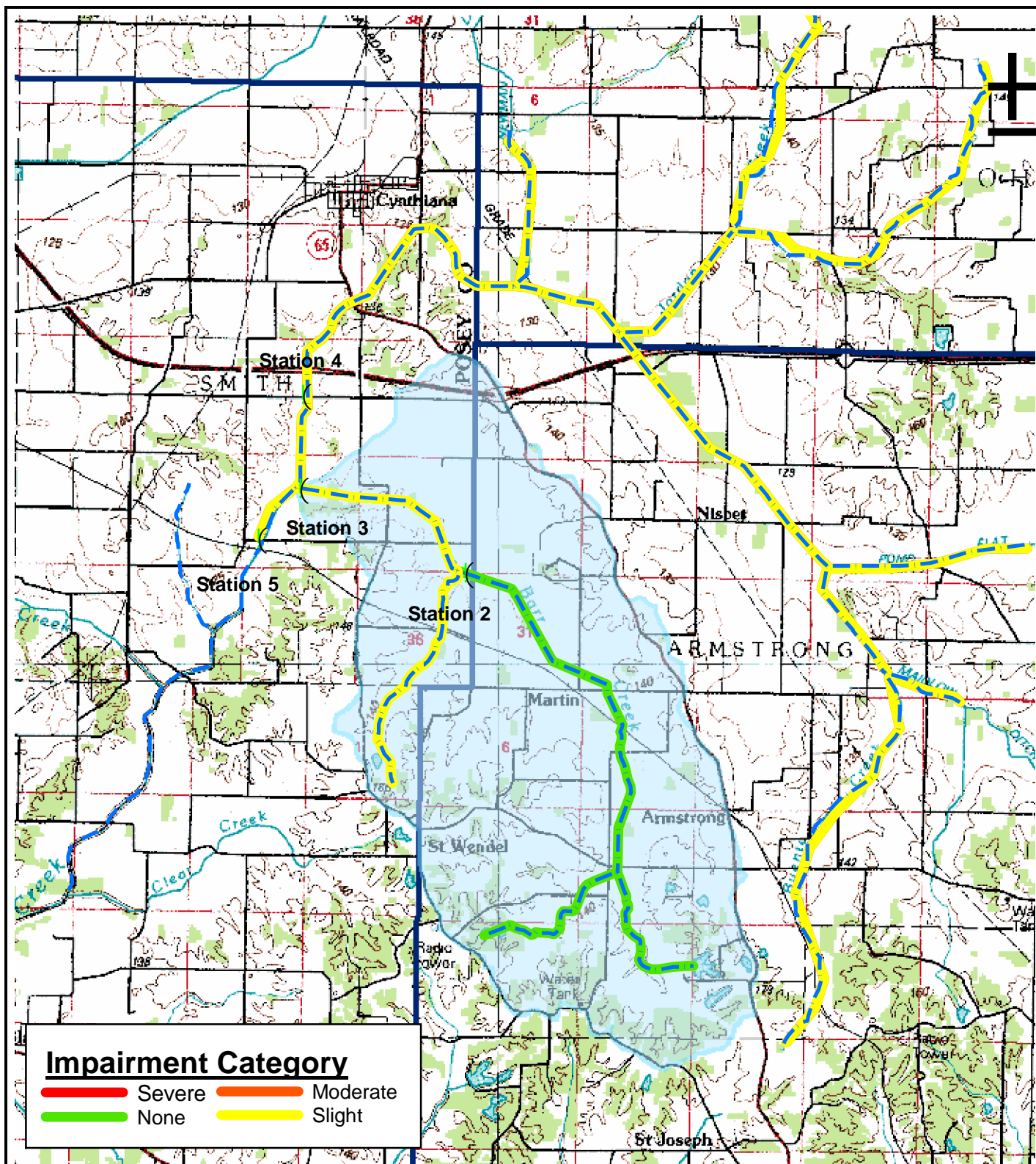



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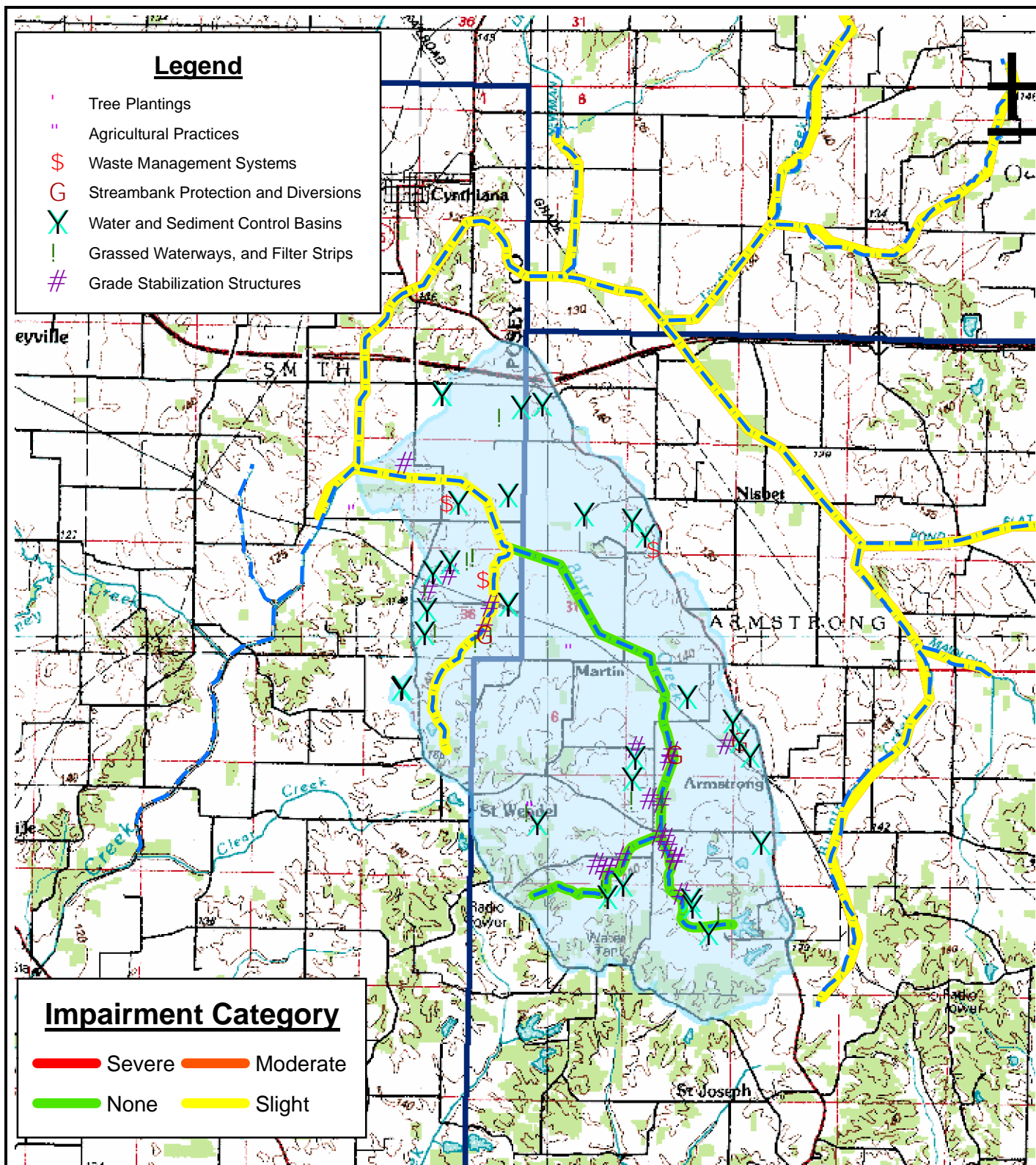
TITLE: 1994 Fall Impairment Categories	PROJECT: Post Construction Monitoring for Barr Creek		
	BASE LAYER: USGS Topographic Map	PROJECT NO. 04011	EXHIBIT: VII
	CLIENT: Vanderburgh County Soil and Water Conservation District 12445 Highway 41 North Evansville, Indiana 4	QUADRANGLE: N/A	DATE: 02-02-05
		SHEET: 1 OF: 1	SCALE: NTS

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 <div>Engineers Scientists Surveyors</div>	7325 Janes Avenue, Suite 100 Woodridge, IL 60517 630.724.9200 voice 630.724.9202 fax v3consultants.com	TITLE: 2004 Fall Impairment Categories	PROJECT: Post Construction Monitoring for Barr Creek		
		BASE LAYER: USGS Topographic Map	PROJECT NO. 04011	EXHIBIT: VIII	SHEET: 1 OF: 1
		CLIENT: Vanderburgh County Soil and Water Conservation District 12445 Highway 41 North Evansville, Indiana 4	QUADRANGLE: N/A	DATE: 02-02-05	SCALE: NTS

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 <div>Engineers Scientists Surveyors</div>	7325 Janes Avenue, Suite 100 Woodridge, IL 60517 630.724.9200 voice 630.724.9202 fax v3consultants.com	TITLE: 2004 Fall Impairment Categories with BMP Locations	PROJECT: Post Construction Monitoring for Barr Creek		
		BASE LAYER: Indiana DNR Best Management Practices Exhibit	PROJECT NO. 04011	EXHIBIT: IX	SHEET: 1 OF: 1
		CLIENT: Vanderburgh County Soil and Water Conservation District 12445 Highway 41 North Evansville, Indiana 4	QUADRANGLE: N/A	DATE: 02-02-05	SCALE: NTS

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5.2 Physical Evaluation Results

The purpose for evaluating the physical habitat features of the selected locations within the Barr Creek watershed is to quantify the condition and quality of the instream and riparian habitat. The use of the U.S. Environmental Protection Agency (USEPA) habitat scoring technique used by the 1994 study was repeated by this study for comparative purposes. This was applied to all five Barr Creek sampling stations. Field datasheets from both spring and fall assessments are provided in Appendix I and station photographs from both spring and fall assessments are provided in Appendix III.

The summary of the USEPA habitat scoring technique from the 1994 and 2004 surveys are provided in Table 8. Additional habitat assessments performed during the 2004 study, including the Ohio EPA Qualitative Habitat Evaluation Index (QHEI) and the USEPA rapid and qualitative habitat assessment, are also included in Appendix I.

TABLE 8 – USEPA HABITAT SCORING TECHNIQUE RESULTS FOR BARR CREEK, 1994 AND 2004

	Station 1		Station 2		Station 3		Station 4		Station 5	
	1994	2004	1994	2004	1994	2004	1994	2004	1994	2004
Habitat Parameters										
Bottom Substrate/Available Cover	16	17	5	10	5	2	6	2	6	1
Embeddedness	15	13	10	13	10	8	10	6	10	6
Velocity and Depth	16	13	6	13	6	13	6	16	6	16
Channel Alteration	11	15	7	6	7	5	7	6	7	4
Bottom Scouring and Deposition	15	6	7	3	7	2	8	1	8	2
Pool/Riffle, Run/Bend Ratio	11	15	7	3	7	2	7	2	7	2
Bank Stability	8	5	5	1	5	1	3	1	3	1
Bank Vegetative Stability	10	3	9	7	9	2	9	2	9	4
Streamside Cover	9	7	5	4	5	2	3	2	3	1
Total Score	107	94	61	60	61	37	59	38	59	37
Percent of Reference	100	100	57	64	57	39	55	40	55	39

Cells that are shaded yellow have improved from 1994 to 2004.

5.3 Chemical Evaluation Results

V3 performed the sampling events on April 27, 28, and 29, and October 12 and 13, 2004. The parameters included oxidation-reduction potential, temperature, conductivity, pH, dissolved oxygen, flow, and turbidity. Water quality data sheets are included in Appendix I. Table 9 summarizes the results from the spring water quality data collected during both the 1994 study and the current 2004 sampling effort. Table 10 summarizes the results from the fall water quality data in the same fashion.

TABLE 9 – SUMMARY OF SPRING SAMPLING WATER QUALITY DATA FOR BARR CREEK, JULY 1994 AND APRIL 2004

	Station 1		Station 2		Station 3		Station 4		Station 5	
	1994	2004	1994	2004	1994	2004	1994	2004	1994	2004
Parameters										
ORP (mV)	-	106	-	33	-	107	-	81	-	81
Temperature (°C)	25.6	12.2	31.1	12.3	36.1	14.6	32.8	21.3	35.0	16.4
Conductivity (µmohms)	530	603	390	460.5	350	518	360	580.7	310	534.4
pH (SU)	8.2	8.21	8.9	8.43	9.3	8.09	8.4	8.03	9.2	8.13
Dissolved Oxygen (mg/L)	7.3	5.74	15.6	6.32	12.2	10.18	10.2	7.49	18.2	9.32
Flow (ft3/sec)	-	2.853	-	2.559	-	3.416	-	10.646	-	17.821
Turbidity (NTU)	-	8.17	-	6.65	-	5.27	-	18.2	-	21.1

TABLE 10 – SUMMARY OF FALL SAMPLING WATER QUALITY DATA FOR BARR CREEK, DECEMBER 1994 AND OCTOBER 2004

	Station 1		Station 2		Station 3		Station 4		Station 5	
	1994	2004	1994	2004	1994	2004	1994	2004	1994	2004
Parameters										
ORP (mV)	-	290	-	246	-	299	-	306	-	281
Temperature (°C)	3.3	14.6	4.4	15.4	3.3	15.4	5.0	16.1	5.6	16.0
Conductivity (µmohms)	640	534.3	500	815.6	510	436.2	440	409	460	404.1
pH (SU)	8.0	7.61	7.8	7.54	7.9	7.58	8.0	7.43	8.0	7.5
Dissolved Oxygen (mg/L)	12.0	7.85	12.0	8.65	13.0	13.8	13.4	8.78	13.4	11.7
Flow (ft3/sec)	-	1.037	-	0.6405	-	0.2422	-	1.465	-	3.622
Turbidity (NTU)	-	5.8	-	14	-	5.7	-	20	-	30

5.4 Field Review

V3 provided Vanderburgh County SWCD, LARE staff, as well as the representatives of interested volunteer water quality monitoring groups with advanced notification of the sampling dates. Representatives of these organizations were able to attend the sampling events and observe and learn the field data collection techniques. The sampling efforts were performed with Amy Steeples, Ronnie Boehm, and Gary Seibert (all three are with the IDNR) in attendance during all of the spring sampling efforts, and Amy Steeples of the IDNR in attendance during all of the fall sampling.

6.0 DISCUSSION

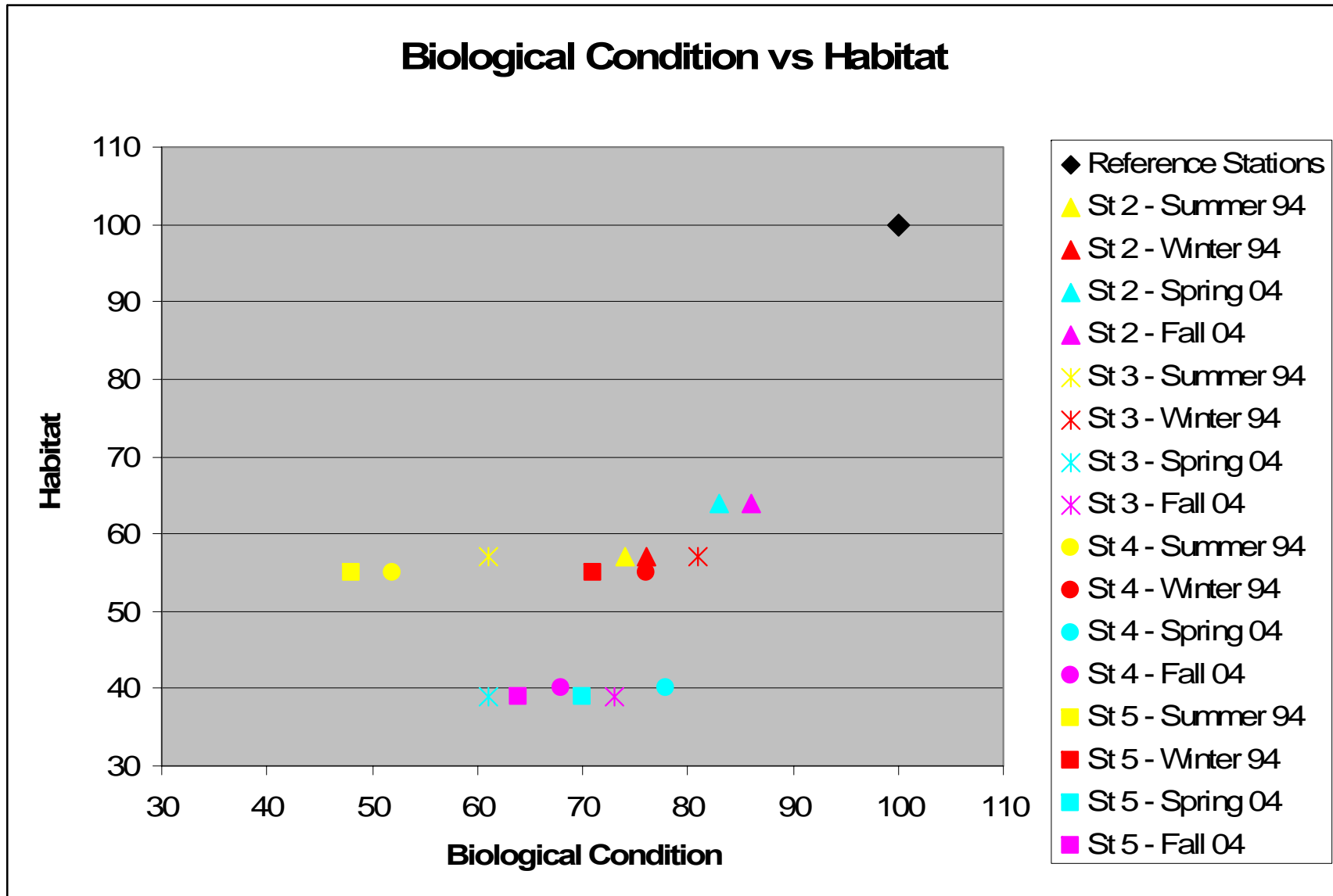
Exhibit X graphically displays comparisons of each station from all of the survey events to their respective reference stations. The reference stations are normalized at 100% of the habitat scoring and 100% of the biological condition. This represents the achievable potential of each sampling station. All four of the sampling events are represented by one graphic point in the upper right corner of the graph, as they all overlap with each other at 100 by 100. Each station is depicted by differing shapes (i.e. triangles represent Station 2, squares represent Station 5). Each sampling event is depicted by differing colors (i.e. yellow represents summer 1994, blue represents spring 2004). The biological data source for this graph can be found on Tables 6 and 7, the habitat source can be found on Table 8.

As the reference stream (Station 1) represents regional expectations, the quality of the stream at Station 2 changed for the better with respect to both the physical and biological condition. Through the interpretation of this graph, Station 2, the upstream most sampling location on Barr Creek, is the only station that demonstrated this trend as both of the 2004 sampling events are closer to the reference station condition than either of the 1994 sampling events. This graph also demonstrates that the habitat condition at Stations 3, 4 and 5 have degraded. Station 3 is the furthest downstream station on Barr Creek, just upstream of the confluence of Barr and Big Creeks. Stations 4 and 5 are both along Big Creek.

The water quality values from the 2004 study represent normal stream conditions and do not represent any regionally atypical situations. However, the habitat quality results do indicate a concern for aquatic life at both Big Creek stations and the most downstream location on Barr Creek. None of the stations are within the habitat classifications of Comparable or Supporting. Only Station 2 is within the habitat classification of Supporting. Stations 3, 4 and 5 are all within the habitat classification of Nonsupporting. The relationship between habitat quality and biological condition demonstrates that good quality habitat will support high quality biological communities, and responses to minor alterations in habitat will be subtle and of little consequence. Discernible biological impairment results as habitat quality continues to decline (USEPA 1989).

In areas of severe habitat degradation, predicting the degree of biological impairment becomes more difficult. Community structure is less dependent on habitat diversity, which is effectively simplified by degradation, and more dependent on the opportunistic colonization strategies of a relatively few tolerant species. These opportunists are adapted to unfavorable environmental conditions and thrive in these marginal conditions. Therefore biological measures are relatively insensitive to habitat variations in this range, and a nonsupporting habitat characterization may correspond to either a moderately or severely impaired biological condition (USEPA 1989).

EXHIBIT X. PERCENTAGE OF REFERENCE STATION FOR BIOLOGICAL CONDITION AND HABITAT, 1994 AND 2004



Habitat at Stations 3, 4 and 5 were all 39 or 40% of the regional expectation represented by the reference station. The qualitative assessment which most significantly contributed the quantitative value representing degradation within the Habitat evaluation parameters is: Bottom Substrate/Available Cover; Pool/Riffle, Run/Bend Ratio; and Channel Alteration. These three parameters provided a comparative shortfall to the reference station of 38 for Station 3, 37 for Station 4, and 40 for Station 5. All three of these stations have unstable silt bottoms, very poor representation of riffles, and are significantly channelized. Unstable substrates eliminate populations of macroinvertebrates that require stable locations to live, such as the net-spinning or the retreat-making caddisflies or the scraping mayflies. The lack of riffles restrict macroinvertebrate population of filter feeders which need flowing water to provide accessibility to their food source.

The macroinvertebrate community analysis compared to the reference site's macroinvertebrate community demonstrated no impairment of the community at Station 2, and slight impairment at Stations 3, 4 and 5. The macroinvertebrate community and habitat scores for Stations 3, 4 and 5 are representative of a situation indicative of nutrient enrichment, which will artificially sustain a more diverse fauna than dictated by the habitat quality. As the habitat degradation proceeds, nutrient enrichment will no longer support a diverse community and a drastic decrease in biological condition will result (USEPA 1989).

V3 performed the 2004 study abiding by the suggested spring and fall sampling seasons as a result of discussions with the IDNR and the Vanderburgh County SWCD. It was concluded that attempting to duplicate the 1994 sampling seasons was not in the best interest of meaningful water quality results. Water temperature readings from summer 1994 were as high as 97⁰F in Barr Creek and 95⁰F in Big Creek. The USEPA STORET database from station #03378550, near Wadesville on Big Creek, approximately five miles downstream of Station 5, lists mean water temperature at 50⁰F and the upper 85th percentile as 72⁰F. If field measurements of water temperature from 1994 were accurate, it is representative of an extreme condition and should have been cause enough for re-scheduling the sampling effort.

Biological samplings in December 1994 were dominated by a genus of stonefly (*Allocapnia* sp.). The 1994 study reports that 73 of 100 organisms collected at Station 2 and 57 of 100 organisms collected at Station 3 during December were *Allocapnia* sp. stoneflies. V3 performed the 2004 study abiding by the suggested spring and fall sampling seasons as a result of discussions with the IDNR and the Vanderburgh County SWCD. It is not likely that sampling outside of the winter months would allow for the collection of *Allocapnia* sp. (DeWalt, 2005; Essig, 2005; Provonsha, 2005). Almost all of the species of *Allocapnia* are associated with the temperate deciduous forests (Ross and Ricker, 1971), of which Barr and Big Creeks are predominately draining agricultural areas.

The *Allocapnia* sp. stonefly emerges from its eggs in April and crawls deep into the sediment during the first instar stage. These larvae spend the months in diapause, which enable the colonization of intermittent streams (Mackie, 2001). In November the larvae migrate through the sediment back to the stream bottom where it eats the fall's leafpack. These stoneflies provide limited pollution tolerance insight as their life cycle allows them to avoid harsh conditions while they are dormant (DeWalt 2005). The high water quality requirements typical of stoneflies

usually exclude their populations from streams with low oxygen levels, high temperatures and nutrient enrichment. However, the *Allocapnia* are able to avoid the detrimental timeframes and survive in streams such as Big and Barr Creeks which possess periods of high temperatures, low oxygen and nutrient enrichment.

Sediment load is an essential component to a healthy stream (Dunne and Leopold, 1978) and a representation of increased sediment intolerant species may denote an undesired geomorphic stream condition. To set sediment intolerant species as a desired community could be achieved with detrimental bedload affects to scouring and erosion. No further discussion of sediment intolerant species will be included in this report.

Differences in land use practices within the watershed from Posey County and Vanderburgh County may explain some of the macroinvertebrate and habitat results from this study. Regionally, Posey County possesses a greater depth of loss or the accumulation of wind blow silts. It is healthier for the aquatic streams, from both a biological and physical perspective, to implement progressive agricultural conservation practices.

The objectives of this study, and future studies, may have benefited from habitat variables that were not presented within this report but were measured during the field assessments of 2004. The Ohio EPA Qualitative Habitat Evaluation Index (QHEI) Field Sheets and the USEPA Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers, Periphyton, Benthic Macroinvertebrates and Fish Habitat Assessment Field Data Sheets have been included within Appendix I. As habitat degradation has been identified at Stations 3, 4 and 5, this data may assist interpretations of future investigations.

7.0 SUMMARY AND RECOMMENDATIONS

Land use best management conservation practices were implemented by both the Vanderburgh and Posey County SWCD's to improve the Barr Creek watershed from 1993 through 1998. The land use best management conservation practices included: no-till conservation tillage, stormwater runoff diversions, cool season grass filter strips, pipe structure grade stabilization structures, a poured concrete toewall grade stabilization structure, rock rip-rap grade stabilization structures, newly created grass waterways, repaired grassed waterways, integrated crop management, pasture and hayland plantings, rock rip-rap streambank protection, tree plantings, waste management containment systems, and water and sediment control basins.

Comparative interpretations were also limited between the 1994 and 2004 studies as different sampling seasons were utilized, the 1994 summer study is comparative to the 2004 spring study and the 1994 winter study is comparative to the 2004 fall study. This discrepancy in seasonality negatively affected the validity of the water quality and benthic macroinvertebrate community comparisons. Additionally, different protocols for the evaluations of benthic macroinvertebrate surveys negatively affected the validity of the comparative results. No data was available from IDEM to assist in this evaluation.

Taking into consideration the limitations of valid comparisons, the 1994 study and the 2004 study are only able to be compared to their regionally achievable potentials, as represented by the reference stations. Rating of the sampling stations in comparison to the reference stations, the conditions of the macroinvertebrate communities either remains constant or it improves from 1994 to 2004. The comparison between the study results from the summer shortly after to the spring more than ten years after the land use best management conservation practices were implemented shows an improved biological condition at Station 2 on Barr Creek (Slight to None) and at Stations 4 and 5 on Big Creek (Moderate to Slight). Comparison between the winter shortly after to the fall more than ten years after show an improved biological condition at Station 2, where the rating improved from Slight Impairment to No Impairment. All other impairment category rankings remained unchanged.

The habitat evaluation used the same methods from the 1994 study to the 2004 study. Habitat showed overall degradation at Stations 3, 4 and 5. Improvements to the watershed specifically related to the stream's substrate condition, lack of available cover, ratio of riffles and runs to pools, and the ditching and channelization.

The best management land use conservation practices implemented by the Vanderburgh and Posey County Soil and Water Conservation Districts to improve the Barr Creek watershed were all located with rural agricultural areas. All of the benthic macroinvertebrate impairment categories by sampling stations through a comparison of 1994 to the 1994 reference station and 2004 sampling stations to the corresponding 2004 reference station either remained the same or showed improvements. Three of the four sampling stations from 1994 to 2004 demonstrated a degraded habitat condition. This report concludes that the measures taken to install no-till conservation tillage, stormwater runoff diversions, cool season grass filter strips, pipe structure grade stabilization structures, a poured concrete toewall grade stabilization structure, rock rip-rap

grade stabilization structures, newly created grass waterways, repaired grassed waterways, integrated crop management, pasture and hayland plantings, rock rip-rap streambank protection, tree plantings, waste management containment systems, and water and sediment control basins may have been effective in improving the quality of some attributes within the Barr Creek watershed. The habitats of Barr and Big Creeks require additional attention.

The 1994 study recommended implementing programs that protect or restore natural streamside vegetation, as well as identifying all areas with severely slumping banks and implementing stabilization projects. These recommendations remain relevant, since ten years later habitat evaluations indicate a lower quality, and implementation measures should be pursued where funding and willing land owner participation exists.

Land use best management conservation practices have been implemented within the 10,000 acres of Barr Creek's watershed. We recommend the continued implementation of habitat focused watershed improvement measures within Barr Creek's watershed, especially within the portions of Posey County. We recommend that similar measures in the upstream rural and agricultural areas of the 40,000 acres of Big Creek's watershed be implemented. Complications may arise as Big Creek's watershed spans Posey, Gibson and Vanderburgh counties, however, the improvements in Barr Creek demonstrate the validity of implementing best management land use conservation practices.

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APPENDIX I:

V3 COMPANIES FIELD DATA SHEETS

page of

Enter Family and/or Genus and Species name on blank line.

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Taxa 21 (19)

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Rush Creek</u>		LOCATION <u>Harmonie State Park</u>	
STATION # <u>1</u> RIVERMILE <u> </u>		STREAM CLASS <u> </u>	
LAT <u> </u> LONG <u> </u>		RIVER BASIN <u> </u>	
STORET # <u> </u>		AGENCY <u> </u>	
INVESTIGATORS <u>WGL, ESB</u>		LOT NUMBER <u> </u>	
FORM COMPLETED BY <u>WGL, ESB</u>		DATE <u>4/27/04</u> TIME <u> </u> AM <u>PM</u>	REASON FOR SURVEY <u> </u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble <u>20</u> % <input type="checkbox"/> Snags <u>5</u> % <input type="checkbox"/> Vegetated Banks <u>50</u> % <input type="checkbox"/> Sand <u>20</u> % <input type="checkbox"/> Submerged Macrophytes <u>2</u> % <input type="checkbox"/> Other (<u> </u>) <u> </u> %
	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other <u> </u> How were the samples collected? <input type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>10</u> <input checked="" type="checkbox"/> Snags <u>10</u> <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> <input checked="" type="checkbox"/> Sand <u>6</u> <input type="checkbox"/> Submerged Macrophytes <u> </u> <input type="checkbox"/> Other (<u> </u>) <u> </u>
GENERAL COMMENTS	<u> </u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	①	2	3	4	Slimes	①	1	2	3	4
Filamentous Algae	0	1	②	3	4	Macroinvertebrates	0	1	2	③	4
Macrophytes	①	1	2	3	4	Fish	0	1	2	③	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Rush Creek</u>		LOCATION	
STATION # <u>1</u> RIVERMILE		STREAM CLASS	
LAT <u>38° 4.518'N</u> LONG <u>87° 52.981'W</u>		RIVER BASIN	
STORET # <u>38° 4.439'N 87° 56.47'W</u>		AGENCY	
INVESTIGATORS <u>EJB, WGL, Gary, Ronnie, Amy</u>			
FORM COMPLETED BY		DATE <u>4/27/04</u> TIME <u>10:30</u> <u>AM</u> PM	REASON FOR SURVEY

WEATHER CONDITIONS	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Now</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input type="checkbox"/> showers (intermittent)</p> <p><input type="checkbox"/> %cloud cover</p> <p><input checked="" type="checkbox"/> clear/sunny</p> </div> <div style="width: 45%;"> <p>Past 24 hours</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/> %</p> </div> </div> <p>Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <u>Saturday Night</u></p> <p>Air Temperature <u>19</u> °C</p> <p>Other _____</p>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <div style="height: 400px; border: 1px solid black;"></div>
STREAM CHARACTERIZATION	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Stream Subsystem</p> <p><input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Origin</p> <p><input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed</p> <p><input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins</p> <p><input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> </div> <div style="width: 45%;"> <p>Stream Type</p> <p><input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km²</p> </div> </div>

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)**

4/27/04
Rush Creek
Site #1

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other <u>State Park</u> <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy	
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Silver Maple, Sycamore</u>			
INSTREAM FEATURES	<table style="width:100%;"> <tr> <td style="width:50%;"> Estimated Reach Length <u>100</u> m Estimated Stream Width <u>10</u> m Sampling Reach Area _____ m² Area in km² (m²x1000) _____ km² Estimated Stream Depth <u>.3</u> m Surface Velocity _____ m/sec (at thalweg) </td><td style="width:50%;"> Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input checked="" type="checkbox"/> Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____ % <input type="checkbox"/> Run _____ % <input type="checkbox"/> Pool _____ % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </td></tr> </table>		Estimated Reach Length <u>100</u> m Estimated Stream Width <u>10</u> m Sampling Reach Area _____ m ² Area in km ² (m ² x1000) _____ km ² Estimated Stream Depth <u>.3</u> m Surface Velocity _____ m/sec (at thalweg)	Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input checked="" type="checkbox"/> Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____ % <input type="checkbox"/> Run _____ % <input type="checkbox"/> Pool _____ % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Estimated Reach Length <u>100</u> m Estimated Stream Width <u>10</u> m Sampling Reach Area _____ m ² Area in km ² (m ² x1000) _____ km ² Estimated Stream Depth <u>.3</u> m Surface Velocity _____ m/sec (at thalweg)	Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input checked="" type="checkbox"/> Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____ % <input type="checkbox"/> Run _____ % <input type="checkbox"/> Pool _____ % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
LARGE WOODY DEBRIS	LWD <u>15</u> m ² Density of LWD _____ m ² /km ² (LWD/ reach area)			
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input checked="" type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>5</u> %			
WATER QUALITY	<table style="width:100%;"> <tr> <td style="width:50%;"> Temperature <u>12.2</u> °C <u>54.02</u> °F Specific Conductance <u>603</u> Dissolved Oxygen <u>29667</u> µg/L pH <u>8.21</u> <u>57420</u> µg/L Turbidity <u>8.17</u> WQ Instrument Used <u>Insitu</u> <u>ORP = 106</u> </td><td style="width:50%;"> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ </td></tr> </table>		Temperature <u>12.2</u> °C <u>54.02</u> °F Specific Conductance <u>603</u> Dissolved Oxygen <u>29667</u> µg/L pH <u>8.21</u> <u>57420</u> µg/L Turbidity <u>8.17</u> WQ Instrument Used <u>Insitu</u> <u>ORP = 106</u>	Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____
Temperature <u>12.2</u> °C <u>54.02</u> °F Specific Conductance <u>603</u> Dissolved Oxygen <u>29667</u> µg/L pH <u>8.21</u> <u>57420</u> µg/L Turbidity <u>8.17</u> WQ Instrument Used <u>Insitu</u> <u>ORP = 106</u>	Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____			
SEDIMENT/SUBSTRATE	<table style="width:100%;"> <tr> <td style="width:50%;"> Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse </td><td style="width:50%;"> Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </td></tr> </table>		Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	20
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	20			
Gravel	2-64 mm (0.1"-2.5")	30	Muck-Mud	black, very fine organic (FPOM)	
Sand	0.06-2mm (gritty)	30			
Silt	0.004-0.06 mm	10			
Clay	< 0.004 mm (slick)	5	Marl	grey, shell fragments	

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Rush Creek</u>	LOCATION <u>Station 1, Harmonie State Park</u>	
STATION # <u>1</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>ESB, WGL</u>		
FORM COMPLETED BY <u>ESB</u>	DATE <u>4/27/04</u> TIME <u>13:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>17</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE <u>16</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE <u>17</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>13</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>16</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration SCORE <u>20</u>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
7. Channel Sinuosity SCORE <u>18</u>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
8. Bank Stability (score each bank) SCORE <u>6</u> (LB) SCORE <u>4</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream. SCORE <u>3</u> (LB) SCORE <u>2</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>1</u> (LB) SCORE <u>1</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.

Total Score 133



Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

78

River Code: _____ RM: _____ Stream: Rush Creek
 Date: 4/27/04 Location: Station 1 Harmonie State Park
 Scorers Full Name: Ed Belmonte Affiliation: V3

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE		SUBSTRATE ORIGIN		SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR /SLBS [10]	_____	<input checked="" type="checkbox"/> GRAVEL [7]	<u>10</u>	Check ONE (OR 2 & AVERAGE)		Check ONE (OR 2 & AVERAGE)	
<input type="checkbox"/> BOULDER [9]	_____	<input type="checkbox"/> SAND [6]	_____	<input type="checkbox"/> LIMESTONE [1]	SILT:	<input type="checkbox"/> SILT HEAVY [-2]	Substrate <div style="border: 1px solid black; padding: 5px; display: inline-block;">17</div> Max 20
<input checked="" type="checkbox"/> COBBLE [8]	<u>5</u>	<input type="checkbox"/> BEDROCK [5]	_____	<input checked="" type="checkbox"/> TILLS [1]	_____	<input checked="" type="checkbox"/> SILT MODERATE [-1]	
<input type="checkbox"/> HARDPAN [4]	_____	<input type="checkbox"/> DETRITUS [3]	_____	<input type="checkbox"/> WETLANDS [0]	_____	<input type="checkbox"/> SILT NORMAL [0]	
<input type="checkbox"/> MUCK [2]	_____	<input type="checkbox"/> ARTIFICIAL [0]	_____	<input type="checkbox"/> HARDPAN [0]	_____	<input type="checkbox"/> SILT FREE [1]	
<input type="checkbox"/> SILT [2]	_____	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SANDSTONE [0]	EMBEDDED	<input type="checkbox"/> EXTENSIVE [-2]	
				<input type="checkbox"/> RIP/RAP [0]	NESS:	<input type="checkbox"/> MODERATE [-1]	
				<input type="checkbox"/> LACUSTRINE [0]		<input checked="" type="checkbox"/> NORMAL [0]	
				<input type="checkbox"/> SHALE [-1]		<input type="checkbox"/> NONE [1]	
				<input type="checkbox"/> COAL FINES [-2]			

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]

COMMENTS: _____

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)	
<input type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]
<input type="checkbox"/> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> SPARSE 5-25% [3]
<input checked="" type="checkbox"/> ROOTMATS [1]	COMMENTS: _____		<input type="checkbox"/> NEARLY ABSENT < 5% [1]

Channel

16

Max 20

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input checked="" type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING <input type="checkbox"/> IMPOUND.
<input checked="" type="checkbox"/> MODERATE [3]	<input checked="" type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION <input checked="" type="checkbox"/> ISLANDS
<input type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL <input type="checkbox"/> LEVEED
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING <input type="checkbox"/> BANK SHAPING
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS

Channel

16

Max 20

COMMENTS: _____

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION	
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)		
<input checked="" type="checkbox"/> WIDE > 50m [4]	<input checked="" type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input type="checkbox"/> NONE/LITTLE [3]		
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input checked="" type="checkbox"/> MODERATE [2]		
<input type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<input type="checkbox"/> HEAVY/SEVERE [1]		
<input type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]			
<input type="checkbox"/> NONE [0]					

Riparian

9

Max 10

COMMENTS: _____

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES!]
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)
<input type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]
<input checked="" type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input checked="" type="checkbox"/> FAST [1]
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS: _____	<input type="checkbox"/> TORRENTIAL [-1]
		<input type="checkbox"/> INTERSTITIAL [-1]
		<input type="checkbox"/> INTERMITTENT [-2]
		<input type="checkbox"/> VERY FAST [1]

Pool/Current

9

Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
<input checked="" type="checkbox"/> Best Areas > 10 cm [2]	<input checked="" type="checkbox"/> MAX > 50 [2]	<input checked="" type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input type="checkbox"/> Best Areas 5-10 cm [1]	<input type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input checked="" type="checkbox"/> LOW [1]
<input type="checkbox"/> Best Areas < 5 cm		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]
[RIFFLE=0]			<input type="checkbox"/> EXTENSIVE [-1]
COMMENTS: _____		<input type="checkbox"/> NO RIFFLE [Metric=0]	

Riffle/Run

7

 = 72
Max 8

Gradient

6

Max 10

6) GRADIENT (ft/mi): _____ DRAINAGE AREA (sq.mi.): 9.2

%POOL: 40 %GLIDE: _____
 %RIFFLE: 20 %RUN: 40

* Best areas must be large enough to support a population of riffle-obligate species

Barr Creek Final Water Quality Monitoring Study - April 27, 2004 - Station 1, Rush Creek, Harmonie State Park
Reference Station for Barr Creek Watershed, Final Water Quality Monitoring Study

Macrobenthos Qualitative Sample List

Vial #

ORDER	FAMILY	GENUS	SPECIES	COUNT	TOLERANCE VALUES	FBI	Parasite
21	Nematomorpha					0.000	Parasite
	Hydracarina-Trombidiformes					0.000	Predators/Parasite
23	Tubellaria	Planaria		3	4	0.125	Omnivore
	Porifera	Spongiidae				0.000	Filters
31	Pelecypoda	Corbiculidae	Corbicula fluminea		3.2	0.000	Filters
		Dreissenidae	Dreissena polymorpha			0.000	Filters
		Unionidae	Villosa iris			0.000	Filters
18		Sphaeriidae		17	8	1.417	Filters
	Gastropoda	Ancylidae				0.000	Scrapers
20		Lymnaeidae		1	6.9	0.072	Scrapers
		Lymnaeidae	Fossaria			0.000	Scrapers
19		Physidae		1	8	0.083	Scrapers
		Physidae	Physella			0.000	Scrapers
		Planorbidae			7	0.000	Scrapers
		Planorbidae	Planorbula		7	0.000	Scrapers
		Pleuroceridae				0.000	Scrapers
		Bithyniidae				0.000	Scrapers
1	Annelida	Hirudinea	Bithynia tentaculata	3	10	0.313	Gathers
25		Oligochaeta		4		0.000	Gathers
26	Decapoda				8	0.000	Predators
17	Amphipoda			25	4	1.042	Shredders
24	Isopoda	Asellidae			8	0.000	Shredders
	Ostracoda				8	0.000	Scavengers
	Ephemeroptera	Caenidae			7	0.000	Gathers
13		Caenidae	Caenis	1	3.1	0.032	Gathers
		Ephemeridae	Hexagenia		3.6	0.000	Gathers
15		Baetidae	Baetis	1	3.1	0.032	Gathers
		Baetidae	Baetis brunneicolor		4	0.000	Gathers
		Baetidae	Baetis intercalans		2.7	0.000	Gathers
		Baetidae	Calibaetis		5.6	0.000	Gathers
14		Heptageniidae	Stenacron	1	3.1	0.032	Scrapers
		Heptageniidae	Stenacron gildersleevei		3.1	0.000	Scrapers
		Heptageniidae	Stenonema		4	0.000	Scrapers
		Heptageniidae	Stenonema exiguum		1.9	0.000	Scrapers
		Isomyiidae	Isomyia		2	0.000	Filters
		Leptophlebiidae	Tricorythodes		2.7	0.000	Gathers
		Siphonuridae			7	0.000	Gathers
		Ephemerellidae	Timpanoga		1	0.000	Gathers
8,9	Coleoptera	Leptophlebiidae			2	0.000	Gathers
		Dytiscidae			5	0.000	Predators
37		Gyrinidae			5	0.000	Predators
		Gyrinidae	Dineutus		3.7	0.000	Predators
27,33		Halpidae			7	0.000	Predators
		Dryopidae			5	0.000	Predators
28,32		Elmidae			4	0.000	Gathers
		Paephenidae	Paephenus		4	0.000	Scrapers
		Hydrophilidae				0.000	Gathers
		Hydrophilidae	Tropisternus			0.000	Gathers
7	Megaloptera	Sialidae			4	0.000	Predators
		Corydalidae	Corydalus		4	0.000	Predators
	Trichoptera	Brachycentridae	Brachycentrus		1	0.000	Filters
		Helicopsychidae	Helicopsyche		3	0.000	Scrapers
		Helicopsychidae	Helicopsyche borealis		3	0.000	Scrapers
16		Hydropsychidae		4	4	0.167	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	Hydropsyche betteni		4	0.000	Filters
		Hydropsychidae	Hydropsyche scalaris		4	0.000	Filters
		Hydropsychidae	Symphitopsyche		4	0.000	Filters
		Hydroptilidae			4	0.000	Gathers
		Hydroptilidae	Hydroptila		3.2	0.000	Gathers
		Leptoceridae			4	0.000	Shredders
		Leptoceridae	Nectopsyche		4	0.000	Shredders
		Molannidae			6	0.000	Gathers
		Phlebotomidae			3	0.000	Filters
		Phygadeuonidae	Hagenella		4	0.000	Shredders
		Polycentropodidae	Cynellus		6	0.000	Filters
		Psychomyiidae	Lype		2	0.000	Gathers
36	Hemiptera	Belostomatidae				0.000	Predators
		Belostomatidae	Belostomatia			0.000	Predators
34		Corixidae			10	0.000	Predators
3		Gerridae		1	5	0.052	Predators
		Gerridae	Trepobates		5	0.000	Predators
		Notonectidae	Notonecta			0.000	Predators
		Nepidae				0.000	Predators
		Nepidae	Ranatra			0.000	Predators
		Peridae	Parletta		1	0.000	Predators
		Peridae	Necopora		1	0.000	Predators
		Chloroperlidae			1	0.000	Predators
	Odonata-Anisoptera	Aeshnidae			3	0.000	Predators
		Aeshnidae	Boyeria		3	0.000	Predators
		Gomphidae			1	0.000	Predators
		Cordulegastridae			3	0.000	Predators
22		Cordulidae			5	0.000	Predators
		Libellulidae			9	0.000	Predators
	Odonata-Zygoptera	Calopterygidae			5	0.000	Predators
4		Calopterygidae	Calopteryx	2	3.7	0.077	Predators
6		Coenagrionidae		2	6.1	0.127	Predators
5		Coenagrionidae	Argia	2	5.1	0.106	Predators
30		Coenagrionidae	Engaetia	2	9	0.000	Predators
		Lestidae			9	0.000	Predators
		Ceratopogonidae			5.7	0.000	Gathers
11	Diptera	Blood-red Chironomidae		15	8.1	1.266	Gathers
12		Other Chironomidae		11	6	0.688	Gathers
35		Culicidae			8	0.000	Shredders
10		Simuliidae		3	6	0.188	Filters
2		Tipulidae		3	3	0.094	Predators
		Stratiomyidae				0.000	Gathers
29		Tabanidae				0.000	Predators

TAXA RICHNESS

FBI	19	
Scrapers/Filter	5.911	
EPT/Chironomidae	0.125	
% Contribution of Dominant Taxa	0.269	
EPT Index	0.250	
Community Similarity Indices	4.000	
	0.000	Comm. Loss = 0
	1.000	Jaccard Coef. = 1
CPOM	0.250	
Total Number Collected	100	

total shredders 25

page of

STREAM NAME <u>Barr Creek</u>		LOCATION <u>County Line Rd</u>
STATION # <u>2</u>	RIVERMILE _____	STREAM CLASS _____
LAT _____	LONG _____	RIVER BASIN _____
STORET # _____		AGENCY _____
COLLECTED BY <u>ESB, WGL</u>	DATE <u>4/28/04</u>	LOT # _____
TAXONOMIST <u>ESB, WGL</u>	DATE _____	SUBSAMPLE TARGET <input type="checkbox"/> 100 <input type="checkbox"/> 200 <input type="checkbox"/> 300 <input type="checkbox"/> Other _____

Enter Family and/or Genus and Species name on blank line.

[illegible]

Taxonormic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I=immature; P=pupa; A=adult TI=Taxonomists initials

Total No. Organisms**Total No. Taxa**

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Barr Ck</u>	LOCATION <u>County Line Rd</u>	
STATION # <u>2</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>ESB, WGL</u>	LOT NUMBER	
FORM COMPLETED BY <u>ESB, WGL</u>	DATE <u>4/28/64</u> TIME _____ AM PM	REASON FOR SURVEY

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>10</u> % <input type="checkbox"/> Snags _____ % <input checked="" type="checkbox"/> Vegetated Banks <u>75</u> % <input type="checkbox"/> Sand <u>60</u> % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other (_____) _____ %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble <u>10</u> <input type="checkbox"/> Snags <u>10</u> <input type="checkbox"/> Vegetated Banks <u>10</u> <input type="checkbox"/> Sand <u>10</u> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	<u>No Caddisflies, hatches</u> <u>Added from Reference - Dragon Flies, Horse hair, Isopods</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	<u>1</u>	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	0	<u>1</u>	2	3	4	Macroinvertebrates	0	1	2	<u>3</u>	4
Macrophytes	0	<u>1</u>	2	3	4	Fish	0	1	<u>2</u>	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Bart Creek</u>		LOCATION <u>Station 2</u> <u>County Line Rd</u>	
STATION # <u>2</u> RIVERMILE		STREAM CLASS	
LAT <u>38° 8.349N</u> LONG <u>87° 41.334W</u>		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS <u>ESB, WGL</u>			
FORM COMPLETED BY <u>ESB, WGL</u>		DATE <u>4/28/04</u> TIME <u>09:00</u> AM PM	REASON FOR SURVEY

WEATHER CONDITIONS			Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <u>Saturday Night</u> Air Temperature <u>22</u> °C Other _____																																																																																																																					
<u>ft</u> DFLB 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0	<u>ft</u> Depth 0.2 0.3 0.5 0.6 0.8 0.7 0.8 0.9 0.9 1.0 0.9 0.9 0.8 0.6 0.6 0.5 0.4	SITE LOCATION/MAP <u>Velocity ft/sec</u> .21 0.52 0.60 0.34 0.41 0.93 1.05 0.94 0.64 0.44 0.49 0.41 0.21 0.12 0.02 (-0.03) (-0.07)	Draw a map of the site and indicate the areas sampled (or attach a photograph) <table border="1"> <thead> <tr> <th>DFLB</th> <th>DEPTH</th> <th>VELO ft/sec</th> <th>DFLB</th> <th>Depth ft</th> <th>Velocity ft/sec</th> </tr> </thead> <tbody> <tr><td>0.5</td><td>0.4</td><td>(-0.02)</td><td>0.5</td><td>0.2</td><td>0.17</td></tr> <tr><td>1.0</td><td>0.7</td><td>0.01</td><td>1.0</td><td>0.5</td><td>0.25</td></tr> <tr><td>1.5</td><td>0.9</td><td>0.08</td><td>1.5</td><td>0.6</td><td>0.32</td></tr> <tr><td>2.0</td><td>1.0</td><td>0.15</td><td>2.0</td><td>0.7</td><td>0.34</td></tr> <tr><td>2.5</td><td>1.2</td><td>0.20</td><td>2.5</td><td>0.8</td><td>0.42</td></tr> <tr><td>3.0</td><td>1.3</td><td>0.28</td><td>3.0</td><td>0.9</td><td>0.54</td></tr> <tr><td>3.5</td><td>1.3</td><td>0.32</td><td>3.5</td><td>0.9</td><td>0.63</td></tr> <tr><td>4.0</td><td>1.3</td><td>0.35</td><td>4.0</td><td>1.0</td><td>0.58</td></tr> <tr><td>4.5</td><td>1.3</td><td>0.38</td><td>4.5</td><td>1.0</td><td>0.61</td></tr> <tr><td>5.0</td><td>1.2</td><td>0.45</td><td>5.0</td><td>1.0</td><td>0.59</td></tr> <tr><td>5.5</td><td>1.2</td><td>0.47</td><td>5.5</td><td>1.0</td><td>0.61</td></tr> <tr><td>6.0</td><td>1.2</td><td>0.26</td><td>6.0</td><td>1.0</td><td>0.54</td></tr> <tr><td>6.5</td><td>1.2</td><td>0.22</td><td>6.5</td><td>0.9</td><td>0.41</td></tr> <tr><td>7.0</td><td>1.1</td><td>0.29</td><td colspan="3" rowspan="4">7.0 RIGHT BANK</td></tr> <tr><td>7.5</td><td>0.8</td><td>0.36</td></tr> <tr><td>8.0</td><td>0.5</td><td>0.32</td></tr> <tr><td>8.5</td><td>0.2</td><td>0.42</td></tr> <tr><td>9.0</td><td>0.2</td><td>0.24</td><td colspan="3"></td></tr> <tr><td>9.5</td><td colspan="2">NO R.D.G.</td><td colspan="3"></td></tr> <tr><td>10.0</td><td colspan="2">RT BANK</td><td colspan="3"></td></tr> </tbody> </table>			DFLB	DEPTH	VELO ft/sec	DFLB	Depth ft	Velocity ft/sec	0.5	0.4	(-0.02)	0.5	0.2	0.17	1.0	0.7	0.01	1.0	0.5	0.25	1.5	0.9	0.08	1.5	0.6	0.32	2.0	1.0	0.15	2.0	0.7	0.34	2.5	1.2	0.20	2.5	0.8	0.42	3.0	1.3	0.28	3.0	0.9	0.54	3.5	1.3	0.32	3.5	0.9	0.63	4.0	1.3	0.35	4.0	1.0	0.58	4.5	1.3	0.38	4.5	1.0	0.61	5.0	1.2	0.45	5.0	1.0	0.59	5.5	1.2	0.47	5.5	1.0	0.61	6.0	1.2	0.26	6.0	1.0	0.54	6.5	1.2	0.22	6.5	0.9	0.41	7.0	1.1	0.29	7.0 RIGHT BANK			7.5	0.8	0.36	8.0	0.5	0.32	8.5	0.2	0.42	9.0	0.2	0.24				9.5	NO R.D.G.					10.0	RT BANK				
DFLB	DEPTH	VELO ft/sec	DFLB	Depth ft	Velocity ft/sec																																																																																																																					
0.5	0.4	(-0.02)	0.5	0.2	0.17																																																																																																																					
1.0	0.7	0.01	1.0	0.5	0.25																																																																																																																					
1.5	0.9	0.08	1.5	0.6	0.32																																																																																																																					
2.0	1.0	0.15	2.0	0.7	0.34																																																																																																																					
2.5	1.2	0.20	2.5	0.8	0.42																																																																																																																					
3.0	1.3	0.28	3.0	0.9	0.54																																																																																																																					
3.5	1.3	0.32	3.5	0.9	0.63																																																																																																																					
4.0	1.3	0.35	4.0	1.0	0.58																																																																																																																					
4.5	1.3	0.38	4.5	1.0	0.61																																																																																																																					
5.0	1.2	0.45	5.0	1.0	0.59																																																																																																																					
5.5	1.2	0.47	5.5	1.0	0.61																																																																																																																					
6.0	1.2	0.26	6.0	1.0	0.54																																																																																																																					
6.5	1.2	0.22	6.5	0.9	0.41																																																																																																																					
7.0	1.1	0.29	7.0 RIGHT BANK																																																																																																																							
7.5	0.8	0.36																																																																																																																								
8.0	0.5	0.32																																																																																																																								
8.5	0.2	0.42																																																																																																																								
9.0	0.2	0.24																																																																																																																								
9.5	NO R.D.G.																																																																																																																									
10.0	RT BANK																																																																																																																									
STREAM CHARACTERIZATION 9.0 0.2 (-0.05) 9.5 NO READING 10 FT - RT BANK			Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____ Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater Catchment Area _____ km²																																																																																																																							

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Station 2
Barr Creek
County Line Rd

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources
			Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Red Canary Grass</u>		
INSTREAM FEATURES	Estimated Reach Length <u>100</u> m Estimated Stream Width <u>12</u> m Sampling Reach Area _____ m ² Area in km² (m²x1000) _____ km ² Estimated Stream Depth <u>1.2</u> m Surface Velocity (at thalweg) _____ m/sec		
	Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____ % <input type="checkbox"/> Run _____ % <input type="checkbox"/> Pool _____ % Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD _____ m ² Density of LWD _____ m ² /km ² (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation _____ %		
WATER QUALITY	Temperature <u>12.3°C</u> <u>54.1°F</u> <u>12.8°C</u> Specific Conductance <u>460.5</u> Dissolved Oxygen <u>6.3252</u> <u>11.5 mg/L</u> pH <u>8.43</u> Turbidity <u>6.65</u> WQ Instrument Used _____ <u>ORP = 33</u>		
	Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____		
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	15
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	10	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	15			
Sand	0.06-2mm (gritty)	20	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	30			
Clay	< 0.004 mm (slick)	20			

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME Bart Creek	LOCATION Station 2, County Line Rd	
STATION # 2 RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS ESB, WGL		
FORM COMPLETED BY ESB, WGL	DATE 4/26/04 TIME 10:30 AM PM	REASON FOR SURVEY

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.	
SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>1</u> (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0	10 9 8 7 6	5 4 3 2 1 0
SCORE <u>1</u> (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0	10 9 8 7 6	5 4 3 2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream. More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE <u>5</u> (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0	10 9 8 7 6	5 4 3 2 1 0
SCORE <u>4</u> (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0	10 9 8 7 6	5 4 3 2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>1</u> (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0	10 9 8 7 6	5 4 3 2 1 0
SCORE <u>1</u> (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0	10 9 8 7 6	5 4 3 2 1 0

Total Score 68



Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

41

River Code: RM: Stream: Barr Creek
Date: 4/28/04 Location: Barr Creek station 2 County Line Rd
Scorers Full Name: Ed Belmont Affiliation: V3

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR /SLBS [10]		<input checked="" type="checkbox"/> GRAVEL [7]	<u>20</u> <u>20</u>	Check ONE (OR 2 & AVERAGE)	Check ONE (OR 2 & AVERAGE)	
<input type="checkbox"/> BOULDER [9]		<input type="checkbox"/> SAND [6]		<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> SILT: <input type="checkbox"/> SILT HEAVY [-2]	
<input type="checkbox"/> COBBLE [8]		<input type="checkbox"/> BEDROCK [5]		<input checked="" type="checkbox"/> TILLS [1]	<input checked="" type="checkbox"/> SILT MODERATE [-1]	Substrate
<input type="checkbox"/> HARDPAN [4]		<input type="checkbox"/> DETRITUS [3]		<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> SILT NORMAL [0]	<div>10</div>
<input type="checkbox"/> MUCK [2]		<input type="checkbox"/> ARTIFICIAL [0]		<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> SILT FREE [1]	Max 20
<input checked="" type="checkbox"/> SILT [2]	<u>30</u> <u>20</u>	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> EXTENSIVE [-2]	
				<input type="checkbox"/> RIP/RAP [0]	<input checked="" type="checkbox"/> MODERATE [-1]	
				NESS:	<input type="checkbox"/> NORMAL [0]	
				<input type="checkbox"/> LACUSTRINE [0]	<input type="checkbox"/> NONE [1]	
				<input type="checkbox"/> SHALE [-1]		
				<input type="checkbox"/> COAL FINES [-2]		

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2]
(High Quality Only, Score 5 or >) ☐ 3 or Less [0]

COMMENTS:

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)	TYPE: Score All That Occur	AMOUNT: (Check ONLY One or check 2 and AVERAGE)	Cover
<input type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> EXTENSIVE > 75% [11]	<div>6</div>
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> MODERATE 25-75% [7]	Max 20
<input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> SPARSE 5-25% [3]	
<input type="checkbox"/> ROOTMATS [1]	COMMENTS:	<input type="checkbox"/> NEARLY ABSENT < 5% [1]	

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	<div>4</div>
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	Max 20
<input type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input checked="" type="checkbox"/> LOW [1]	<input checked="" type="checkbox"/> CANOPY REMOVAL	
<input checked="" type="checkbox"/> NONE [1]	<input checked="" type="checkbox"/> POOR [1]	<input checked="" type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)

BANK EROSION

Riparian

L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input type="checkbox"/> NONE/LITTLE [3]
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input checked="" type="checkbox"/> MODERATE [2]
<input type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input checked="" type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<input type="checkbox"/> HEAVY/SEVERE [1]
<input checked="" type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]	Max 10
<input type="checkbox"/> NONE [0]			

COMMENTS:

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES!]	Pool/Current
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	
<input type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]	<div>7</div>
<input type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input checked="" type="checkbox"/> FAST [1]	Max 12
<input checked="" type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]	
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]	
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS:	<input type="checkbox"/> TORRENTIAL [-1]	
		<input type="checkbox"/> INTERSTITIAL [-1]	
		<input type="checkbox"/> INTERMITTENT [-2]	
		<input type="checkbox"/> VERY FAST [1]	

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run
<input type="checkbox"/> Best Areas > 10 cm [2]	<input checked="" type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	<div>5</div>
<input checked="" type="checkbox"/> Best Areas 5-10 cm [1]	<input type="checkbox"/> MAX < 50 [1]	<input checked="" type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input checked="" type="checkbox"/> LOW [1]	Max 8
<input type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]	Gradient
COMMENTS:			<input type="checkbox"/> EXTENSIVE [-1]	<div>6</div>
			<input type="checkbox"/> NO RIFFLE [Metric=0]	Max 10

6) GRADIENT (ft/mi): DRAINAGE AREA (sq.mi.): 9.7

%POOL: 80 %GLIDE:
%RIFFLE: 5 %RUN: 55

* Best areas must be large enough to support a population of riffle-obligate species

Macrobenthos Qualitative Sample List

Vial #

ORDER	FAMILY	GENUS	SPECIES	COUNT	TOLERANCE VALUES	FBI	
21	Nematomorpha					0.000	Parasite
	Hydracarina- Trombidiformes					0.000	Predators/Parasite
23	Tubellaria	Planaris		3	4	0.129	Omnivore
	Forifera	Sponillidae				0.000	Filters
31	Polycypoda	Corbiculidae	Corbicula		3.2	0.000	Filters
		Dreissenidae	Dreissena			0.000	Filters
		Unionidae	Villosa			0.000	Filters
18		Sphaeriidae		6	8	0.516	Filters
	Gastropoda	Ancylidae			6	0.000	Scrapers
20		Lymnaeidae			6.9	0.000	Scrapers
		Lymnaeidae	Fossaria		6	0.000	Scrapers
19		Physidae		4	8	0.344	Scrapers
		Physidae	Physella		8	0.000	Scrapers
		Planorbidae			7	0.000	Scrapers
		Planorbidae	Planorbula		7	0.000	Scrapers
		Pleuroceridae				0.000	Scrapers
		Bithyniidae	Bithynia			0.000	Scrapers
1	Annelida	Hirudinea	tentaculata		10	0.000	Gathers
25		Oligochaeta		6		0.000	Gathers
26	Decapoda			1	8	0.088	Predators
17	Amphipoda			10	4	0.430	Shredders
24	Isopoda	Aeolidae		5	8	0.430	Shredders
	Ostracoda				8	0.000	Scavengers
	Ephemeroptera	Caenidae			7	0.000	Gathers
13		Caenidae	Caenis	1	3.1	0.033	Gathers
		Ephemeridae	Hexagenia		3.5	0.000	Gathers
15		Baetidae	Baetis	1	3.1	0.033	Gathers
		Baetidae	Baetis		4	0.000	Gathers
		Baetidae	brunneicollis		2.7	0.000	Gathers
		Baetidae	Calibaetis		5.6	0.000	Gathers
14		Haptageniidae	Stenacron	1	3.1	0.033	Scrapers
		Haptageniidae	Stenacron		3.1	0.000	Scrapers
		Haptageniidae	Stenonema		4	0.000	Scrapers
		Haptageniidae	Stenonema		1.9	0.000	Scrapers
		Isonychidae	Isonychia		2	0.000	Filters
		Leptophlebiidae	Tricorythodes		2.7	0.000	Gathers
		Siphonuridae			7	0.000	Gathers
		Ephemerellidae	Timpanoga		1	0.000	Gathers
8,9		Leptophlebiidae			2	0.000	Gathers
37	Coleoptera	Dytiscidae			5	0.000	Predators
		Gyrinidae			5	0.000	Predators
27,33		Halpidae	Dineutus	17	3.7	0.000	Predators
		Dryopidae			7	1.280	Predators
28,32		Elmidae		1	5	0.000	Predators
		Psaphenidae	Psaphenus		4	0.043	Gathers
		Hydrophilidae				0.000	Scrapers
7		Hydrophilidae	Tropisternus	1		0.000	Gathers
	Megaboptera	Sialidae			4	0.000	Predators
		Corydalidae	Corydalus		4	0.000	Predators
	Trichoptera	Brachycentridae	Brachycentrus		1	0.000	Filters
		Helicopsychidae	Helicopsyche		3	0.000	Scrapers
		Helicopsychidae	Helicopsyche		3	0.000	Scrapers
16		Hydropsychidae	borealis		4	0.000	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	batteni		4	0.000	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	Symphitopsyche		4	0.000	Filters
		Hydroptilidae			4	0.000	Gathers
		Hydroptilidae	Hydroptila		3.2	0.000	Gathers
		Leptoceridae			4	0.000	Shredders
		Leptoceridae	Nectopsyche		4	0.000	Shredders
		Molannidae			6	0.000	Gathers
		Phlebotomidae			3	0.000	Filters
		Phryganeidae	Hagenella		4	0.000	Shredders
		Polychaetopodidae	Cymellus		6	0.000	Filters
		Psychomyiidae	Lype		2	0.000	Gathers
36	Hemiptera	Belostomatidae	Belostoma			0.000	Predators
		Belostomatidae	Belostoma			0.000	Predators
34		Corixidae			10	0.000	Predators
3		Gerridae		1	5	0.054	Predators
		Gerridae	Trepobates		5	0.000	Predators
		Notonectidae	Notonecta			0.000	Predators
		Nepidae				0.000	Predators
		Nepidae	Ranatra			0.000	Predators
	Plecoptera	Perlidae	Perla		1	0.000	Predators
		Perlidae	Neoperla		1	0.000	Predators
		Chloroperlidae			1	0.000	Predators
	Odonata-Anisoptera	Aeshnidae			3	0.000	Predators
		Aeshnidae	Boyeria		3	0.000	Predators
		Gomphidae			1	0.000	Predators
		Cordulegastridae			3	0.000	Predators
22		Cordulidae		4	5	0.215	Predators
		Libellulidae			9	0.000	Predators
	Odonata-Zygoptera	Calopterygidae			5	0.000	Predators
4		Calopterygidae	Calopteryx		3.7	0.000	Predators
5		Coenagrionidae		4	6.1	0.262	Predators
5		Coenagrionidae	Argia		5.1	0.000	Predators
30		Coenagrionidae	Engallagma		9	0.000	Predators
		Leptidae			9	0.000	Predators
		Ceratopogonidae			5.7	0.000	Gathers
11	Diptera	Blood-red Chironomidae		24	8.1	2.090	Gathers
12		Other Chironomidae		6	6	0.387	Gathers
35		Culicidae			6	0.000	Shredders
10		Simuliidae		2	6	0.129	Filters
2		Tipulidae		1	3	0.032	Predators
		Stratiomyidae			6	0.000	Gathers
25		Tabanidae		1	6	0.065	Predators

TAXA RICHNESS

FBI

Scrapers/Filter

EPT/Chironomidae

% Contribution of Dominant Taxa

EPT Index

Community Similarity Indices

CPOM

Total Number Collected

total shredders

21

6.592

0.825

0.100

0.240

3.000

0.238

0.538

0.150

15

Comm. Loss = 0.238

Jaccard Coef. = 0.538

page of

Enter Family and/or Genus and Species name on blank line.

Taxonomist certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

7 (13)

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Barr Creek</u>	LOCATION <u>Upstream of confluence w/ Big Creek</u>	
STATION # <u>3</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>Amey WBL, EJD</u>	LOT NUMBER	
FORM COMPLETED BY	DATE <u>04/29/04</u> TIME <u>10:30</u> (AM) PM	REASON FOR SURVEY

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble <u>0</u> % <input type="checkbox"/> Snags <u>0</u> % <input type="checkbox"/> Vegetated Banks <u>10</u> % <input type="checkbox"/> Sand <u>15</u> % <input type="checkbox"/> Submerged Macrophytes <u>0</u> % <input type="checkbox"/> Other (Silt concretions) <u>75</u> %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks <u>20</u> <input type="checkbox"/> Sand <u>20</u> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other (Silt concretions) <u>20</u>
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	0	1	<u>2</u>	3	4	Macroinvertebrates	0	1	<u>2</u>	3	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	0	1	2	<u>3</u>	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Barr Creek</u>		LOCATION <u>Station 3</u> <u>upstream of confluence with Big Creek</u>	
STATION # <u>3</u> RIVERMILE _____		STREAM CLASS _____	
LAT <u>38° 8.985N</u> LONG <u>87° 42.935W</u>		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>Amy, Wally, EJB</u>			
FORM COMPLETED BY _____		DATE <u>04/29/04</u> TIME <u>9:30</u> <u>AM</u> PM	REASON FOR SURVEY _____

WEATHER CONDITIONS		Now		Past 24 hours	Has there been a heavy rain in the last 7 days?			
		<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % _____	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <u>Sat</u> Air Temperature <u>23</u> °C Other _____				
SITE LOCATION/MAP		Draw a map of the site and indicate the areas sampled (or attach a photograph)						
Dist LB	Depth (ft)	Velocity (ft/sec)	DFLB	DEPTH (ft)	Velocity (ft/sec)	DFLB	Depth (ft)	Velocity (ft/sec)
0.5'	0.4	1.21	0.5	0.2	0.59	0.5	0.3	0.61
1.0'	0.4	0.93	1.0	0.2	0.71	1.0	0.5	0.69
1.5	0.4	1.06	1.5	0.2	0.76	1.5	0.5	0.75
2.0	0.4	1.17	2.0	0.2	0.68	2.0	0.5	0.87
2.5	0.4	1.19	2.5	0.2	0.70	2.5	0.6	1.08
3.0	0.4	1.11	3.0	0.3	0.92	3.0	0.6	1.13
3.5	0.4	1.32	3.5	0.3	1.11	3.5	0.6	1.30
4.0	0.4	1.32	4.0	0.3	1.21	4.0	0.6	1.35
4.5	0.4	1.47	4.5	0.4	1.29	4.5	0.5	1.32
5.0	0.4	1.27	5.0	0.4	1.12	5.0	0.4	1.47
5.5	0.4	1.06	5.5	0.5	1.32	5.5	0.4	1.30
6.0	0.3	1.18	6.0	0.6	1.19	6.0	0.5	0.81
6.5	0.3	1.15	6.5	0.6	1.08	6.5	0.5	0.54
7.0	0.3	1.25	7.0	0.6	1.03	7.0	0.5	0.36
7.5	0.2	0.60	7.5	0.5	0.91	7.5 RIGHT BANK		
8.0	0.3	0.52	8.0	0.6	1.02			
8.5	0.3	0.52	8.5	0.6	0.81			
8.10	0.3	0.52	9.0	0.4	0.52			
8.5	NO RDG		9.5 RIGHT BANK					
STREAM CHARACTERIZATION		Stream Subsystem		Stream Type				
		<input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	<input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater Catchment Area _____ km ²					

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Station 3
Barr Creek
Upstream of Confluence
with Big Creek
4/29/04

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources
			Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Reed Canary Grass</u>		
INSTREAM FEATURES	Estimated Reach Length <u>100</u> m Estimated Stream Width <u>2.5</u> m Sampling Reach Area _____ m ² Area in km ² (m ² x1000) _____ km ² Estimated Stream Depth _____ m Surface Velocity _____ m/sec (at thalweg) Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____ % <input type="checkbox"/> Run _____ % <input type="checkbox"/> Pool _____ % Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD _____ m ² Density of LWD _____ m ² /km ² (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>10</u> %		
WATER QUALITY YSI = 14.6 °C D.O. = 11.55 mg/L	Temperature <u>14.6</u> °C <u>58.2</u> °F Specific Conductance <u>518</u> Dissolved Oxygen <u>101853</u> pH <u>8.09</u> Turbidity <u>5.27</u> WQ Instrument Used <u>In situ</u> <u>ORP = 107</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other		
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	10			
Sand	0.06-2mm (gritty)	20	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	30			
Clay	< 0.004 mm (slick)	40			

Bluegill
Minnow sp.
Elephant Ear Mussel
alive

Cricket Frog
HACH Water Quality Test Strips
Softshell Turtles

Phosphate = 0 ppm
Nitrite = 0.15 ppm
Nitrate = 5 ppm
PO4-

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Barr Creek</u>	LOCATION <u>Station 3 upstream of Confl w/ Big Creek</u>	
STATION # <u>3</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>Amy, Wally, EJB</u>		
FORM COMPLETED BY	DATE <u>4/29/04</u> TIME <u>10:30</u> AM PM	REASON FOR SURVEY

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>2</u>				
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE <u>2</u>				
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE <u>10</u>				
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>2</u>				
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>12</u>				

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>7</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.	
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>1</u> (LB)	20 Bank 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
SCORE <u>1</u> (RB)	20 Bank 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE <u>3</u> (LB)	20 Bank 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
SCORE <u>2</u> (RB)	20 Bank 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>1</u> (LB)	20 Bank 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
SCORE <u>1</u> (RB)	20 Bank 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Total Score 46

~ 285 feet from Confluence of Barr + Big to Downstream End of Station 3

Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 40.5

River Code: _____ RM: _____ Stream: Barr Creek
Date: 4/22/04 Location: Barr Creek Station 3 upstream of confluence w/ Big Creek
Scorers Full Name: Ed Belmonte Affiliation: N3 Approx 2.85 upstream of Big Creek

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE

POOL RIFFLE

POOL RIFFLE SUBSTRATE ORIGIN

SUBSTRATE QUALITY

☐ BLDR /SLBS [10] _____☐ GRAVEL [7] _____

Check ONE (OR 2 & AVERAGE)

Check ONE (OR 2 & AVERAGE)

☐ BOULDER [9] _____☐ SAND [6] _____☐ LIMESTONE [1] SILT:☐ SILT HEAVY [-2]☐ COBBLE [8] _____☐ BEDROCK [5] _____☒ TILLS [1]☒ SILT MODERATE [-1]☒ HARDPAN [4] 30 50☐ DETRITUS [3] _____☐ WETLANDS [0]☐ SILT NORMAL [0]☐ MUCK [2] _____☐ ARTIFICIAL [0] _____☒ HARDPAN [0]☐ SILT FREE [1]☒ SILT [2] 30 20

NOTE: Ignore Sludge Originating From Point Sources

☐ SANDSTONE [0] EMBEDDED☐ EXTENSIVE [-2]☐ RIP/RAP [0]

NESS:

☒ MODERATE [-1]NUMBER OF SUBSTRATE TYPES:
(High Quality Only, Score 5 or >)☒ 4 or More [2]☐ 3 or Less [0]☐ LACUSTRINE [0]☒ NORMAL [0]☐ SHALE [-1]☐ NONE [1]☐ COAL FINES [-2]

COMMENTS: _____

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

(Structure)

TYPE: Score All That Occur

AMOUNT: (Check ONLY One or check 2 and AVERAGE)

☒ UNDERCUT BANKS [1]☒ POOLS > 70 cm [2]☐ OXBOWS, BACKWATERS [1]☐ EXTENSIVE > 75% [11]☐ OVERHANGING VEGETATION [1]☐ ROOTWADS [1]☒ AQUATIC MACROPHYTES [1]☐ MODERATE 25-75% [7]☐ SHALLOWS (IN SLOW WATER) [1]☐ BOULDERS [1]☒ LOGS OR WOODY DEBRIS [1]☒ SPARSE 5-25% [3]☐ ROOTWADS [1]

COMMENTS: _____

☒ NEARLY ABSENT < 5% [1]

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY

DEVELOPMENT

CHANNELIZATION

STABILITY

MODIFICATIONS/OTHER

☐ HIGH [4]☐ EXCELLENT [7]☐ NONE [6]☐ HIGH [3]☐ SNAGGING☐ IMPOUND.☐ MODERATE [3]☐ GOOD [5]☐ RECOVERED [4]☐ MODERATE [2]☐ RELOCATION☐ ISLANDS☒ LOW [2]☐ FAIR [3]☐ RECOVERING [3]☒ LOW [1]☒ CANOPY REMOVAL☐ LEVEED☐ NONE [1]☒ POOR [1]☒ RECENT OR NO☐ DREDGING☐ BANK SHAPING

RECOVERY [1]

☐ ONE SIDE CHANNEL MODIFICATIONS

COMMENTS: _____

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)

BANK EROSION

L R (Per Bank)

L R (Most Predominant Per Bank)

L R

L R (Per Bank)

☐ WIDE > 50m [4]☐ FOREST, SWAMP [3]☐ CONSERVATION TILLAGE [1]☐ NONE/LITTLE [3]☐ MODERATE 10-50m [3]☐ SHRUB OR OLD FIELD [2]☐ URBAN OR INDUSTRIAL [0]☒ MODERATE [2]☐ NARROW 5-10 m [2]☐ RESIDENTIAL, PARK, NEW FIELD [1]☒ OPEN PASTURE, ROWCROP [0]☒ HEAVY/SEVERE [1]☒ VERY NARROW < 5 m [1]☐ FENCED PASTURE [1]☐ MINING/CONSTRUCTION [0]☐ NONE [0]

COMMENTS: _____

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH

MORPHOLOGY

CURRENT VELOCITY [POOLS & RIFFLES!]

(Check 1 ONLY!)

(Check 1 or 2 & AVERAGE)

(Check All That Apply)

☐ > 1m [6]☒ POOL WIDTH > RIFFLE WIDTH [2]☐ EDDIES [1]☐ TORRENTIAL [-1]☒ 0.7-1m [4]☐ POOL WIDTH = RIFFLE WIDTH [1]☒ FAST [1]☐ INTERSTITIAL [-1]☐ 0.4-0.7m [2]☐ POOL WIDTH < RIFFLE W. [0]☒ MODERATE [1]☐ INTERMITTENT [-2]☐ 0.2-0.4m [1]☒ SLOW [1]☐ VERY FAST [1]☐ < 0.2m [POOL=0]

COMMENTS: _____

RIFPLE DEPTH

RUN DEPTH

RIFPLE/RUN SUBSTRATE

RIFPLE/RUN EMBEDDEDNESS

☒ Best Areas > 10 cm [2]☒ MAX > 50 [2]☐ STABLE (e.g., Cobble, Boulder) [2]☐ NONE [2]☐ Best Areas 5-10 cm [1]☐ MAX < 50 [1]☐ MOD. STABLE (e.g., Large Gravel) [1]☐ LOW [1]☐ Best Areas < 5 cm☒ UNSTABLE (Fine Gravel, Sand) [0]☒ MODERATE [0]

[RIFPLE=0]

☐ EXTENSIVE [-1]

COMMENTS: _____

☐ NO RIFPLE [Metric=0]6) GRADIENT (ft/mi): _____ DRAINAGE AREA (sq.mi.): 15.6%POOL: 20

%GLIDE: _____

%RIFPLE: 10%RUN: 70

* Best areas must be large enough to support a population of riffle-obligate species

Macrobenthos Qualitative Sample List

Vial #

ORDER	FAMILY	GENUS	SPECIES	COUNT	TOLERANCE VALUES	FBI	
21	Nematomorpha					0.000	Parasite
	Hydracarina- Trombidiformes					0.000	Predators/Parasite
23	Tubellaria	Pisania			4	0.000	Omnivore
	Porifera	Spongiidae				0.000	Filters
31	Polychaeta	Corbiculidae	Corbicula	fluminea	3	3.2	0.097 Filters
		Dreissenidae	Dreissena	polymorpha			0.000 Filters
		Unionidae	Villosa	iris			0.000 Filters
18		Sphaeriidae			8		0.000 Filters
	Gastropoda	Anodidae			6		0.000 Scrapers
20		Lymnaeidae			6.9		0.000 Scrapers
		Lymnaeidae	Fossaria		6		0.000 Scrapers
19		Physidae		2	8		0.162 Scrapers
		Physidae	Physella		8		0.000 Scrapers
		Planorbidae			7		0.000 Scrapers
		Planorbidae	Planorbula		7		0.000 Scrapers
		Planorbidae					0.000 Scrapers
		Bithyniidae	Bithynia	tentaculata			0.000 Scrapers
1	Annelida	Hirudinae			10		0.000 Gathers
25		Oligochaeta		1			0.000 Gathers
26	Decapoda			1	8		0.081 Predators
17	Amphipoda			9	4		0.364 Shredders
24	Isopoda	Asellidae		1	8		0.081 Shredders
	Ostracoda				8		0.000 Scavengers
	Ephemeroptera	Caenidae			7		0.000 Gathers
13		Caenidae	Caenis	1	3.1		0.031 Gathers
		Ephemeridae	Hexagenia		3.6		0.000 Gathers
15		Beetidae	Beetis		3.1		0.000 Gathers
		Beetidae	Beetis	brunneicolor	4		0.000 Gathers
		Beetidae	Beetis	intercalans	2.7		0.000 Gathers
		Beetidae	Calibaetis		5.6		0.000 Gathers
14		Heptageniidae	Stenacron	1	3.1		0.031 Scrapers
		Heptageniidae	Stenacron	gildersleevei	3.1		0.000 Scrapers
		Heptageniidae	Stenonema		4		0.000 Scrapers
		Heptageniidae	Stenonema	exiguum	1.9		0.000 Scrapers
		Isonychidae	Isonychia		2		0.000 Filters
		Leptohyphidae	Tricorythodes		2.7		0.000 Gathers
		Siphonuridae			7		0.000 Gathers
		Ephemeralidae	Timpanoga		1		0.000 Gathers
		Leptohyphidae			2		0.000 Gathers
8,9	Coeloptera	Dytiscidae			5		0.000 Predators
37		Gyrinidae			5		0.000 Predators
		Gyrinidae	Dineutus		3.7		0.000 Predators
27,33		Halpidae		1	7		0.071 Predators
		Dryopidae			5		0.000 Predators
28,32		Elmidae			4		0.000 Gathers
		Psephenidae	Psephenus		4		0.000 Scrapers
		Hydrophilidae					0.000 Gathers
		Hydrophilidae	Tropisternus				0.000 Gathers
7	Megaloptera	Stalkidae			4		0.000 Predators
		Corydalidae	Corydalus		4		0.000 Predators
	Trichoptera	Brachycentridae	Brachycentrus		1		0.000 Filters
		Helicopsychidae	Helicopsyche		3		0.000 Scrapers
		Helicopsychidae	Helicopsyche	borealis	3		0.000 Scrapers
16		Hydropsychidae			4		0.000 Filters
		Hydropsychidae	Hydropsyche		4		0.000 Filters
		Hydropsychidae	Hydropsyche	betteni	4		0.000 Filters
		Hydropsychidae	Hydropsyche	scalaris	4		0.000 Filters
		Hydropsychidae	Symptopsycha		4		0.000 Filters
		Hydroptilidae			4		0.000 Gathers
		Hydroptilidae	Hydroptila		3.2		0.000 Gathers
		Leptoceridae			4		0.000 Shredders
		Leptoceridae	Nectopsyche		4		0.000 Shredders
		Molannidae			5		0.000 Gathers
		Philopotamidae			3		0.000 Filters
		Phryganidae	Hagenella		4		0.000 Shredders
		Polychaetidae	Cynellus		6		0.000 Filters
		Psychomyiidae	Lype		2		0.000 Gathers
36	Hemiptera	Belostomatidae					0.000 Predators
		Belostomatidae	Belostoma				0.000 Predators
34		Corixidae			10		0.000 Predators
3		Gerridae			5		0.000 Predators
		Gerridae	Trepobates		5		0.000 Predators
		Notonectidae	Notonecta				0.000 Predators
		Nepidae					0.000 Predators
		Nepidae	Ranatra				0.000 Predators
	Plecoptera	Perlidae	Perlsta		1		0.000 Predators
		Perlidae	Neoperla		1		0.000 Predators
		Chironomidae			1		0.000 Predators
	Odonata-Anisoptera	Aeshnidae			3		0.000 Predators
		Aeshnidae	Boyeria		3		0.000 Predators
		Gomphidae			1		0.000 Predators
		Cordulegastridae			3		0.000 Predators
22		Cordulidae		9	5		0.455 Predators
		Libellulidae			9		0.000 Predators
	Odonata-Zygoptera	Calopterygidae			5		0.000 Predators
4		Calopterygidae	Calopteryx		3.7		0.000 Predators
6		Coenagrionidae			5.1		0.000 Predators
5		Coenagrionidae	Argia	1	5.1		0.052 Predators
30		Coenagrionidae	Engallagma	4	9		0.364 Predators
		Leptidae			9		0.000 Predators
		Ceratopogonidae			5.7		0.000 Gathers
11	Diptera	Blood-red Chironomidae		18	8.1		1.473 Gathers
12		Other Chironomidae		36	6		2.182 Gathers
35		Culicidae			6		0.000 Shredders
10		Simuliidae		12	6		0.727 Filters
2		Tipulidae			3		0.000 Predators
		Stratiomyidae			6		0.000 Gathers
25		Taenioidea			5		0.000 Predators

TAXA RICHNESS

FBI 6.169
 Scraper/Filter 0.200
 EPT/Chironomidae 0.037
 % Contribution of Dominant Taxa 0.360
 EPT Index 2.000
 Community Similarity Indices 0.667

Comm. Loss = 0.667
 Jaccard Coef. = 0.360

CPOM

Total Number Collected

100

total shredders

10

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

page 1 of 1

STREAM NAME <u>Big Creek</u>		LOCATION <u>Water Tank RJ</u>	
STATION # <u>4</u> RIVERMILE <u> </u>		STREAM CLASS <u> </u>	
LAT <u> </u> LONG <u> </u>		RIVER BASIN <u> </u>	
STORET # <u> </u>		AGENCY <u> </u>	
COLLECTED BY <u>ESB, WGL</u> DATE <u>4/29/04</u>		LOT # <u> </u>	
TAXONOMIST <u>ESB, WGL</u> DATE <u> </u>		SUBSAMPLE TARGET <input type="checkbox"/> 100 <input type="checkbox"/> 200 <input type="checkbox"/> 300 <input type="checkbox"/> Other <u> </u>	

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR
Oligochaeta	<u>IIII</u> (12) <u>X</u>	<u>A</u>	<u>WGL</u>	<u>1</u>	Megaloptera				
Hirudinea					Coleoptera				
Isopoda	<u>IIII</u> (2) <u>X</u>	<u>A</u>	<u>WGL</u>	<u>1</u>	Dytiscidae	<u>II</u> (1) <u>Z</u>	<u>A</u>	<u>WGL</u>	<u>1</u>
Amphipoda	<u>II</u> (1) <u>X</u>	<u>A</u>	<u>WGL</u>	<u>1</u>	Halipidae	<u>IIII</u> (8) <u>X</u>	<u>A</u>	<u>WGL</u>	<u>1</u>
Decapoda					Diptera	<u>Simuliidae</u> - <u>IIII</u> (3) <u>Z</u>	<u>I</u>	<u>WGL</u>	<u>1</u>
Ephemeroptera	<u>Canid</u> - <u>III</u> (2) <u>X</u>	<u>I</u>	<u>WGL</u>	<u>1</u>	Brown chis	<u>IIII</u> (2) <u>X</u>	<u>I</u>	<u>WGL</u>	<u>1</u>
	<u>Baelid</u> - <u>IIII</u> (4) <u>X</u>	<u>I</u>	<u>WGL</u>	<u>1</u>	Black Red	<u>IIII</u> (4) <u>X</u>	<u>I</u>	<u>WGL</u>	<u>1</u>
					Gastropoda	<u>LHS</u> - <u>II</u> - <u>Physidae</u> (2) <u>X</u>	<u>A</u>	<u>WGL</u>	<u>1</u>
						<u>Embion</u> - <u>I</u> (1) <u>X</u>	<u>A</u>	<u>WGL</u>	<u>1</u>
						<u>Lplanorbidae</u>			
Plecoptera					Pelecypoda				
					<u>Eurason</u>	<u>IIII</u> (4) <u>X</u>	<u>A</u>	<u>WGL</u>	<u>1</u>
					Other	<u>Cornagranidae</u> <u>IIII</u> (4) <u>X</u>	<u>I</u>	<u>WGL</u>	<u>1</u>
					<u>calopteryx</u>	<u>IIII</u> (4) <u>X</u>	<u>I</u>	<u>WGL</u>	<u>1</u>
					<u>planaria</u>	<u>II</u> (3) <u>X</u>	<u>A</u>	<u>WGL</u>	<u>1</u>
Trichoptera	<u>Hydropsychidae</u> - <u>IIII</u> (3) <u>X</u>	<u>I</u>	<u>WGL</u>	<u>1</u>	Horse Hair	<u>I</u> (2) <u>X</u>	<u>A</u>	<u>WGL</u>	<u>1</u>
					Dragon Fly	<u>II</u> (1) <u>X</u>	<u>I</u>	<u>WGL</u>	<u>1</u>
Hemiptera									

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 48 (100)

Total No. Taxa 18

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Big Creek</u>	LOCATION <u>Station 4, W. Fork Fork Rd</u>	
STATION # <u>4</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>Amy, WGL, EJB</u>	LOT NUMBER	
FORM COMPLETED BY <u>EJB, WGL</u>	DATE <u>4/29/04</u> TIME <u>5:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>10</u> % <input type="checkbox"/> Snags _____ % <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other (_____) _____ %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>10</u> <input checked="" type="checkbox"/> Snags <u>10</u> <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> <input checked="" type="checkbox"/> Sand <u>10</u> <input checked="" type="checkbox"/> Submerged Macrophytes <u>10</u> <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	<u>Duckweed</u> <u>Arrow head</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Big Creek</u>		LOCATION <u>Upstream of Water Tank Rd Station 4</u>	
STATION # <u>4</u> RIVERMILE		STREAM CLASS	
LAT <u>38° 9.70' N</u> LONG <u>87° 42.916' W</u>		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS <u>Amy, Wally, EJB</u>			
FORM COMPLETED BY <u>EJB</u>		DATE <u>04/29/04</u> TIME <u>15:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY

WEATHER CONDITIONS	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny		Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <u>Saturday</u> Air Temperature <u>26</u> °C Other _____				
	SITE LOCATION/MAP Draw a map of the site and indicate the areas sampled (or attach a photograph)							
DFLB DEPTH VELOCITY FT. FT. / SEC	DFLB	DEPTH FT	VELOCITY FT / SEC	DFLB	DEPTH FT	VELOCITY FT / SEC		
1.0'	1.2	(-0.03)	1.0	0.8	.32	1.0	1.0	-0.04
2.0	1.4	(-0.04)	2.0	1.2	.40	2.0	1.8	-0.02
3.0	1.4	(-0.04)	3.0	1.5	.25	3.0	2.0	-0.07
4.0	1.6	0.09	4.0	1.4	.52	4.0	2.2	.01
5.0	1.6	0.49	5.0	1.5	.59	5.0	2.1	.06
6.0	1.6	0.78	6.0	1.6	.62	6.0	2.3	.07
7.0	1.6	1.02	7.0	1.4	.63	7.0	2.4	.18
8.0	1.6	0.91	8.0	1.4	.62	8.0	2.3	.20
9.0	1.5	1.05	9.0	1.5	.61	9.0	2.3	.28
10.0	1.5	0.76	10.0	1.4	.60	10.0	2.4	.40
11.0	1.3	0.63	11.0	1.2	.67	11.0	2.5	.47
12.0	1.3	0.58	12.0	1.2	.67	12.0	2.5	.51
13.0	1.1	0.58	13.0	1.2	.65	13.0	2.5	.57
14.0	0.4	0.17	14.0	1.3	.48	14.0	2.6	.55
15 = RT BANK			15.0	1.0	.38	15.0	2.5	.48
			16.0	0.2	.12	16.0	2.3	.56
			16.5	RT Bank		17.0	2.0	.25
						18.0	1.3	.15
						19.0	.5	.13
						20	RT Bank	

STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal		Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater	
	Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____		Catchment Area _____ km²	

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Red Canary Grass</u>		
INSTREAM FEATURES	Estimated Reach Length <u>100</u> m Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Estimated Stream Width <u>7</u> m High Water Mark _____ m Sampling Reach Area _____ m ² Area in km ² (m ² x 1000) _____ km ² Estimated Stream Depth <u>1</u> m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle <u>10</u> % <input type="checkbox"/> Run <u>40</u> % <input type="checkbox"/> Pool <u>50</u> % Surface Velocity _____ m/sec Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (at thalweg) Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD _____ m ² Density of LWD _____ m ² /km ² (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>5</u> %		
WATER QUALITY	Temperature <u>21.3</u> °C <u>70.3</u> °F Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Specific Conductance <u>580.7</u> Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Dissolved Oxygen <u>7.4859</u> Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input checked="" type="checkbox"/> Turbid pH <u>8.03</u> <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ Turbidity <u>18.2</u> WQ Instrument Used <u>In situ</u> <u>DRP = 81</u>		
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	10
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	10			
Gravel	2-64 mm (0.1"-2.5")	25	Muck-Mud	black, very fine organic (FPOM)	
Sand	0.06-2mm (gritty)	30			
Silt	0.004-0.06 mm	20			
Clay	< 0.004 mm (slick)	10	Marl	grey, shell fragments	5

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Big Creek</u>	LOCATION <u>Station 4, Water Tank Rd</u>		
STATION # <u>4</u> RIVERMILE	STREAM CLASS		
LAT _____ LONG _____	RIVER BASIN		
STORET #	AGENCY		
INVESTIGATORS <u>Amy, Wally, EJB</u>			
FORM COMPLETED BY <u>EJB</u>	DATE <u>04/29/04</u> TIME <u>16:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY	

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE <u>7</u>				
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE <u>12</u>				
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE <u>13</u>				
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE <u>4</u>				
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE <u>14</u>				

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration SCORE <u>8</u>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
7. Channel Sinuosity SCORE <u>1</u>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
	SCORE <u>1</u>			
8. Bank Stability (score each bank) SCORE <u>2</u> (LB) SCORE <u>1</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream. SCORE <u>3</u> (LB) SCORE <u>1</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	SCORE <u>3</u> (LB)			
	SCORE <u>1</u> (RB)			
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>1</u> (LB) SCORE <u>1</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE <u>1</u> (LB) SCORE <u>1</u> (RB)	Left Bank			
	Right Bank			

Total Score 68



Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

46

River Code: RM: Stream: Big Creek
 Date: 4/29/04 Location: Station 4, Water Tank Rd
 Scorers Full Name: Ed Belmonte Affiliation: V3

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE		POOL RIFFLE		SUBSTRATE ORIGIN		SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR /SLBS [10]		<input checked="" type="checkbox"/> GRAVEL [7]	<u>10</u>	<u>30</u>	Check ONE (OR 2 & AVERAGE)		Check ONE (OR 2 & AVERAGE)		
<input type="checkbox"/> BOULDER [9]		<input type="checkbox"/> SAND [6]			<input type="checkbox"/> LIMESTONE [1]	SILT:	<input type="checkbox"/> SILT HEAVY [-2]	Substrate <div style="border: 1px solid black; padding: 5px; display: inline-block;">10</div> Max 20	
<input type="checkbox"/> COBBLE [8]		<input type="checkbox"/> BEDROCK [5]			<input checked="" type="checkbox"/> TILLS [1]		<input checked="" type="checkbox"/> SILT MODERATE [-1]		
<input type="checkbox"/> HARDPAN [4]		<input type="checkbox"/> DETRITUS [3]			<input type="checkbox"/> WETLANDS [0]		<input type="checkbox"/> SILT NORMAL [0]		
<input type="checkbox"/> MUCK [2]		<input type="checkbox"/> ARTIFICIAL [0]			<input type="checkbox"/> HARDPAN [0]		<input type="checkbox"/> SILT FREE [1]		
<input checked="" type="checkbox"/> SILT [2]	<u>50</u>	NOTE: Ignore Sludge Originating From Point Sources			<input type="checkbox"/> SANDSTONE [0]	EMBEDDED	<input type="checkbox"/> EXTENSIVE [-2]		
					<input type="checkbox"/> RIP/RAP [0]	NESS:	<input checked="" type="checkbox"/> MODERATE [-1]		
					<input type="checkbox"/> LACUSTRINE [0]		<input type="checkbox"/> NORMAL [0]		
					<input type="checkbox"/> SHALE [-1]		<input type="checkbox"/> NONE [1]		
					<input type="checkbox"/> COAL FINES [-2]				

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2]
 (High Quality Only, Score 5 or >) ☐ 3 or Less [0]

COMMENTS:

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)		Cover
<input type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]	<div style="border: 1px solid black; padding: 5px; display: inline-block;">8</div> Max 20
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]	<input type="checkbox"/> MODERATE 25-75% [7]	
<input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input checked="" type="checkbox"/> SPARSE 5-25% [3]	
<input type="checkbox"/> ROOTMATS [1]	COMMENTS:		<input type="checkbox"/> NEARLY ABSENT < 5% [1]	

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	<div style="border: 1px solid black; padding: 5px; display: inline-block;">5</div> Max 20
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	
<input checked="" type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input type="checkbox"/> RECOVERING [3]	<input checked="" type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL	
<input type="checkbox"/> NONE [1]	<input checked="" type="checkbox"/> POOR [1]	<input checked="" type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION		Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R		L R (Per Bank)		<div style="border: 1px solid black; padding: 5px; display: inline-block;">3</div> Max 10
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]		<input type="checkbox"/> NONE/LITTLE [3]		
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]		<input checked="" type="checkbox"/> MODERATE [2]		
<input type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input checked="" type="checkbox"/> OPEN PASTURE, ROWCROP [0]		<input type="checkbox"/> HEAVY/SEVERE [1]		
<input checked="" type="checkbox"/> VERY NARROW < 5m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]				

COMMENTS:

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES!]	Pool/Current	
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	<div style="border: 1px solid black; padding: 5px; display: inline-block;">9</div> Max 12	
<input type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]		<input type="checkbox"/> TORRENTIAL [-1]
<input checked="" type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input checked="" type="checkbox"/> FAST [1]		<input type="checkbox"/> INTERSTITIAL [-1]
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]		<input type="checkbox"/> INTERMITTENT [-2]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]		<input type="checkbox"/> VERY FAST [1]

☐ < 0.2m [POOL=0]

COMMENTS:

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run
<input checked="" type="checkbox"/> Best Areas > 10 cm [2]	<input checked="" type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	<div style="border: 1px solid black; padding: 5px; display: inline-block;">5</div> Max 8
<input type="checkbox"/> Best Areas 5-10 cm [1]	<input type="checkbox"/> MAX < 50 [1]	<input checked="" type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]	
<input type="checkbox"/> Best Areas < 5 cm		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input checked="" type="checkbox"/> MODERATE [0]	
[RIFFLE=0]			<input type="checkbox"/> EXTENSIVE [-1]	<div style="border: 1px solid black; padding: 5px; display: inline-block;">6</div> Max 10
COMMENTS:		<input type="checkbox"/> NO RIFFLE [Metric=0]		

6] GRADIENT (ft/mi): DRAINAGE AREA (sq.mi.): 62.3

%POOL: 40 %GLIDE:
 %RIFFLE: 10 %RUN: 50

* Best areas must be large enough to support a population of riffle-obligate species

Macrobenthos Qualitative Sample List

Vial #

ORDER	FAMILY	GENUS	SPECIES	COUNT	TOLERANCE VALUES	FBI	
21	Nematomorpha					0.000	Parasite
	Hydracarina- Trombidiformes					0.000	Predators/Parasite
23	Tubellaria	Planaria		3	4	0.136	Omnivore
	Forifera	Scorallidae				0.000	Filters
31	Polycypoda	Corbicula	fluminea	9	3.2	0.327	Filters
		Dreissena	polymorpha			0.000	Filters
		Unio	iris			0.000	Filters
18		Sphaeriidae			8	0.000	Filters
	Gastropoda	Ancylidae			6	0.000	Scrapers
20		Lymnaeidae			6.9	0.000	Scrapers
		Lymnaeidae	Fossaria		6	0.000	Scrapers
19		Physidae	Physella	1	8	0.091	Scrapers
		Physidae			8	0.000	Scrapers
		Planorbidae		1	7	0.060	Scrapers
		Planorbidae	Planorbula		7	0.000	Scrapers
		Planorbidae				0.000	Scrapers
		Planorbidae				0.000	Scrapers
		Bithyniidae	Bithynia			0.000	Gathers
1	Annulida				10	0.000	Gathers
25		Hirudinea		12		0.000	Gathers
26	Decapoda	Oligochaeta			8	0.000	Predators
17	Amphipoda			1	4	0.045	Shredders
24	Isopoda	Asellidae		2	8	0.182	Shredders
	Ostracoda				8	0.000	Scavengers
	Ephemeroptera	Caenidae			7	0.000	Gathers
13		Caenidae	Caenis	2	3.1	0.070	Gathers
		Ephemeridae	Hexagenia		3.6	0.000	Gathers
15		Baetidae	Baetis	4	3.1	0.141	Gathers
		Baetidae	Baetis		4	0.000	Gathers
		Baetidae	Baetis		2.7	0.000	Gathers
		Baetidae	Caillietia		5.6	0.000	Gathers
14		Heptageniidae	Stenacron		3.1	0.000	Scrapers
		Heptageniidae	Stenacron		3.1	0.000	Scrapers
		Heptageniidae	Stenonema		4	0.000	Scrapers
		Heptageniidae	Stenonema		1.9	0.000	Scrapers
		Isomyiidae	Isomyia		2	0.000	Filters
		Leptophlebiidae	Tricorythodes		2.7	0.000	Gathers
		Siphonuridae			7	0.000	Gathers
		Ephemeralidae	Timpanoga		1	0.000	Gathers
		Leptophlebiidae			2	0.000	Gathers
8,9	Coleoptera	Dytiscidae		1	5	0.057	Predators
37		Gyrinidae			5	0.000	Predators
		Gyrinidae	Dineutus		3.7	0.000	Predators
27,33		Helophidae		8	7	0.636	Predators
		Dryopidae			5	0.000	Predators
28,32		Elmidae			4	0.000	Gathers
		Paephenidae	Peephenus		4	0.000	Scrapers
		Hydrophilidae				0.000	Gathers
7		Hydrophilidae	Tropisternus			0.000	Gathers
	Megaboptera	Sialidae			4	0.000	Predators
		Corydalidae	Corydalus		4	0.000	Predators
	Trichoptera	Brachycentridae	Brachycentrus		1	0.000	Filters
		Helicopsychidae	Helicopsyche		3	0.000	Scrapers
		Helicopsychidae	Helicopsyche		3	0.000	Scrapers
16		Hydropsychidae		3	4	0.136	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	Symphlepsyche		4	0.000	Filters
		Hydroptilidae			4	0.000	Gathers
		Hydroptilidae	Hydroptila		3.2	0.000	Gathers
		Leptoceridae			4	0.000	Shredders
		Leptoceridae	Nectopsyche		4	0.000	Shredders
		Molannidae			5	0.000	Gathers
		Phlebotomidae			3	0.000	Filters
		Phryganeidae	Hagenella		4	0.000	Shredders
		Polychaetopodidae	Cymellus		6	0.000	Filters
		Psychomyiidae	Lype		2	0.000	Gathers
36	Hemiptera	Belostomatidae	Belostoma			0.000	Predators
		Belostomatidae				0.000	Predators
34		Corixidae			10	0.000	Predators
3		Gerridae			5	0.000	Predators
		Gerridae	Tropobates		5	0.000	Predators
		Notonectidae	Notonecta			0.000	Predators
		Nepidae				0.000	Predators
		Nepidae	Ranatra			0.000	Predators
	Plecoptera	Perlidae	Perla		1	0.000	Predators
		Perlidae	Neoperla		1	0.000	Predators
		Chloroperlidae			1	0.000	Predators
	Odonata-Anisoptera	Aeshnidae			3	0.000	Predators
		Aeshnidae	Boyeria		3	0.000	Predators
		Gomphidae			1	0.000	Predators
		Cordulegastridae			3	0.000	Predators
22		Cordulidae		1	5	0.057	Predators
		Libellulidae			9	0.000	Predators
	Odonata-Zygoptera	Calopterygidae			5	0.000	Predators
4		Calopterygidae	Calopteryx	14	3.7	0.589	Predator
6		Coenagrionidae		6	6.1	0.416	Predators
5		Coenagrionidae	Argia		5.1	0.000	Predators
30		Coenagrionidae	Engallagma		9	0.000	Predators
		Lestidae			9	0.000	Predators
	Diptera	Ceratopogonidae			5.7	0.000	Gathers
11		Blood-red Chironomidae		9	8.1	0.828	Gathers
35		Culicidae		21	6	1.432	Gathers
10		Simuliidae		2	6	0.000	Shredders
2		Tipulidae			3	0.000	Predators
20		Stratiomyidae			6	0.000	Gathers
20		Stratiomyidae				0.000	Predator

TAXA RICHNESS

FBI

Scrapers/Filter

EPT/Chironomidae

% Contribution of Dominant Taxa

EPT Index

Community Similarity Indices

CPOM

Total Number Collected

total shredders

10

5.360

0.143

0.300

0.210

3.000

0.389

0.480

0.030

3

Comm. Loss = 0.389

Jaccard Coef. = 0.480

page of

STREAM NAME <u>Big Creek</u>	LOCATION <u>Emge Road Station 5</u>
STATION # <u>5</u>	RIVERMILE _____
LAT <u>38° 8.603' N</u>	LONG <u>87° 43.339' W</u>
STORET # _____	STREAM CLASS _____
COLLECTED BY <u>EJB, WGL</u>	RIVER BASIN _____
DATE <u>4/28/04</u>	AGENCY _____
TAXONOMIST <u>EJB, WGL</u>	LOT # _____
DATE _____	SUBSAMPLE TARGET <input type="checkbox"/> 100 <input type="checkbox"/> 200 <input type="checkbox"/> 300 <input type="checkbox"/> Other _____

Enter Family and/or Genus and Species name on blank line.

[illegible]

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 100

Total No. Taxa (14)

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Big Creek</u>	LOCATION <u>Emge Road Station 5</u>	
STATION # <u>5</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>EDB, WCL</u>	LOT NUMBER	
FORM COMPLETED BY <u>EDB</u>	DATE <u>4/26/04</u> TIME <u>13:45</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>5</u> % <input type="checkbox"/> Snags _____ % <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> % <input type="checkbox"/> Sand <u>0</u> % <input type="checkbox"/> Submerged Macrophytes <u>0</u> % <input type="checkbox"/> Other (_____) _____ %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input checked="" type="checkbox"/> Kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble <u>20</u> <input type="checkbox"/> Snags <u>0</u> <input type="checkbox"/> Vegetated Banks <u>10</u> <input type="checkbox"/> Sand <u>0</u> <input type="checkbox"/> Submerged Macrophytes <u>0</u> <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	<u>1</u>	2	3	4	Slimes	<u>1</u>	1	2	3	4
Filamentous Algae	0	<u>1</u>	2	3	4	Macroinvertebrates	0	1	2	<u>3</u>	4
Macrophytes	<u>1</u>	1	2	3	4	Fish	0	1	<u>2</u>	3	4

Bluegill, top minnow

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Big Creek</u>		LOCATION <u>Emge Road Station 5</u>	
STATION # <u>5</u> RIVERMILE _____		STREAM CLASS _____	
LAT <u>38° 8.603' N</u> LONG <u>87° 43.39' W</u>		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>Amy, Gary, Ronnie, Wally, ESB</u>			
FORM COMPLETED BY <u>ESB, WGL</u>		DATE <u>4/28/04</u> TIME <u>12:30</u> AM <input checked="" type="radio"/> PM <input type="radio"/>	REASON FOR SURVEY _____

WEATHER CONDITIONS DFLB	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input checked="" type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny		Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <u>Saturday Night</u> Air Temperature <u>23</u> °C Other _____				
	SITE LOCATION/MAP Draw a map of the site and indicate the areas sampled (for attach a photograph)							
DEPTH ft.	VEL. ft./sec	DFLB	Depth ft.	Velocity ft./sec	DFLB	Depth ft.	Vel. ft./sec	
1.5	0.9	1.61	1.5	1.0	0.57	15	1.2	(-0.12)
3.0	1.4	0.92	3.0	1.2	0.72	3.0	1.7	0.02
4.5	1.3	1.53	4.5	1.3	0.76	4.5	1.7	0.58
6.0	1.1	1.69	6.0	1.4	0.79	6.0	1.8	0.29
7.5	1.0	1.44	7.5	1.4	0.74	7.5	1.0	(-0.14)
9.0	0.6	1.50	9.0	2.1	0.66	9.0	1.6	0.20
10.5	0.8	0.77	10.5	2.0	0.61	10.5	1.5	1.26
12.0	0.9	0.72	12.0	2.6	0.45	12.0	1.6	1.39
13.5	1.0	0.13	13.5	2.7	0.51	13.5	1.3	1.72
15.0	0.4	0.91	15.0	2.5	0.40	15.0	1.3	1.01
16.5	0.7	0.72	16.5	2.2	0.27	16.5	1.3	0.94
18.0	0.2	0.56	18.0	2.2	0.22	18.0	1.1	0.48
19.5	0.3	0.18	19.5	2.1	0.08	19.5	0.9	0.51
21	NO READING		21.0	1.4	0.13	21.0	0.7	0.40
22.0	RIGHT BANK		22.5	1.1	(-0.02)	22.5	0.5	0.46
			24.0	RT BANK		24	0.2	0.25
						25.5	0.4	0.39
						27.0	RT. BANK	
STREAM CHARACTERIZATION		Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____						
		Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater Catchment Area _____ km²						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Station 5
4/28/04
Big Creek
Emge Road

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources
			Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Reed Canary Grass</u>		
INSTREAM FEATURES	Estimated Reach Length <u>100</u> m Estimated Stream Width <u>10</u> m Sampling Reach Area _____ m ² Area in km ² (m ² x1000) _____ km ² Estimated Stream Depth <u>1</u> m Surface Velocity _____ m/sec Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>5</u> m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle <u>5</u> % <input type="checkbox"/> Run <u>20</u> % <input type="checkbox"/> Pool <u>75</u> % Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD _____ m ² Density of LWD _____ m ² /km ² (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>2</u> %		
WATER QUALITY	Temperature <u>61.6 °F 16.4 °C</u> Specific Conductance <u>534.4</u> Dissolved Oxygen <u>93207</u> pH <u>8.13</u> Turbidity <u>21.1</u> WQ Instrument Used <u>In situ</u> <u>ORP = 81</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input checked="" type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____		
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	2%
Boulder	> 256 mm (10")	10			
Cobble	64-256 mm (2.5"-10")	10	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	10			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	40			
Clay	< 0.004 mm (slick)	20			

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Big Creek</u>	LOCATION <u>Emge Road Station 5</u>	
STATION # <u>5</u> RIVERMILE _____	STREAM CLASS _____	
LAT _____ LONG _____	RIVER BASIN _____	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>Amy, Ronnie, Gary, Wally, EJB</u>		
FORM COMPLETED BY _____	DATE <u>4/28/04</u> TIME <u>14:00</u> AM (PM)	REASON FOR SURVEY _____

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE <u>2</u>				
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE <u>6</u>				
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE <u>13</u>				
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE <u>7</u>				
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE <u>16</u>				

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration SCORE 6	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
7. Channel Sinuosity SCORE 2	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
8. Bank Stability (score each bank) SCORE 1 (LB) SCORE 1 (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream. SCORE 3 (LB) SCORE 5 (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE 1 (LB) SCORE 1 (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.

Total Score 64



Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

40.5

River Code: RM: Stream: Big Creek
Date: 4/28/04 Location: Emage Road, Station 5
Scorers Full Name: Ed Belmonte Affiliation: V3

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
<input type="checkbox"/> -BLDR /SLBS [10]		<input type="checkbox"/> -GRAVEL [7]		Check ONE (OR 2 & AVERAGE)	Check ONE (OR 2 & AVERAGE)
<input type="checkbox"/> -BOULDER [9]		<input type="checkbox"/> -SAND [6]		<input type="checkbox"/> -LIMESTONE [1]	<input type="checkbox"/> -SILT HEAVY [-2]
<input type="checkbox"/> -COBBLE [8]		<input type="checkbox"/> -BEDROCK [5]		<input checked="" type="checkbox"/> -TILLS [1]	<input checked="" type="checkbox"/> -SILT MODERATE [-1]
<input type="checkbox"/> -HARDPAN [4]		<input type="checkbox"/> -DETRITUS [3]		<input type="checkbox"/> -WETLANDS [0]	<input type="checkbox"/> -SILT NORMAL [0]
<input type="checkbox"/> -MUCK [2]		<input checked="" type="checkbox"/> -ARTIFICIAL [0]	5	<input type="checkbox"/> -HARDPAN [0]	<input type="checkbox"/> -SILT FREE [1]
<input checked="" type="checkbox"/> -SILT [2]	90	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> -SANDSTONE [0]	<input type="checkbox"/> -EXTENSIVE [-2]
				<input type="checkbox"/> -RIP/RAP [0]	<input checked="" type="checkbox"/> -MODERATE [-1]
				<input type="checkbox"/> -LACUSTRINE [0]	<input type="checkbox"/> -NORMAL [0]
				<input type="checkbox"/> -SHALE [-1]	<input type="checkbox"/> -NONE [1]
				<input type="checkbox"/> -COAL FINES [-2]	

NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >) ☒ 4 or More [2] ☐ 3 or Less [0]

COMMENTS:

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)
<input type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> - EXTENSIVE > 75% [11]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> - MODERATE 25-75% [7]
<input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> - SPARSE 5-25% [3]
<input type="checkbox"/> ROOTWADS [1]	COMMENTS:	<input type="checkbox"/> - NEARLY ABSENT < 5% [1]

COVER: 7 Max 20

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> - HIGH [4]	<input type="checkbox"/> - EXCELLENT [7]	<input type="checkbox"/> - NONE [6]	<input type="checkbox"/> - HIGH [3]	<input type="checkbox"/> - SNAGGING	<input type="checkbox"/> - IMPOUND. <input type="checkbox"/> - ISLANDS <input type="checkbox"/> - LEVEED <input type="checkbox"/> - BANK SHAPING <input type="checkbox"/> - ONE SIDE CHANNEL MODIFICATIONS
<input type="checkbox"/> - MODERATE [3]	<input type="checkbox"/> - GOOD [5]	<input type="checkbox"/> - RECOVERED [4]	<input type="checkbox"/> - MODERATE [2]	<input type="checkbox"/> - RELOCATION	
<input checked="" type="checkbox"/> - LOW [2]	<input type="checkbox"/> - FAIR [3]	<input type="checkbox"/> - RECOVERING [3]	<input checked="" type="checkbox"/> - LOW [1]	<input checked="" type="checkbox"/> - CANOPY REMOVAL	
<input type="checkbox"/> - NONE [1]	<input checked="" type="checkbox"/> - POOR [1]	<input checked="" type="checkbox"/> - RECENT OR NO RECOVERY [1]			

Channel: 5 Max 20

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION		Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)			
<input type="checkbox"/> - WIDE > 50m [4]	<input type="checkbox"/> - FOREST, SWAMP [3]	<input type="checkbox"/> - CONSERVATION TILLAGE [1]	<input type="checkbox"/> - NONE/LITTLE [3]			<input type="checkbox"/> - MODERATE [2] <input checked="" type="checkbox"/> - HEAVY/SEVERE [1]
<input type="checkbox"/> - MODERATE 10-50m [3]	<input type="checkbox"/> - SHRUB OR OLD FIELD [2]	<input type="checkbox"/> - URBAN OR INDUSTRIAL [0]				
<input type="checkbox"/> - NARROW 5-10m [2]	<input type="checkbox"/> - RESIDENTIAL, PARK, NEW FIELD [1]	<input checked="" type="checkbox"/> - OPEN PASTURE, ROWCROP [0]				
<input checked="" type="checkbox"/> - VERY NARROW < 5m [1]	<input type="checkbox"/> - FENCED PASTURE [1]	<input type="checkbox"/> - MINING/CONSTRUCTION [0]				
<input type="checkbox"/> - NONE [0]						

Riparian: 2.5 Max 10

COMMENTS:

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES]	Pool/Current
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	
<input checked="" type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> - EDDIES [1]	<input type="checkbox"/> - TORRENTIAL [-1] <input type="checkbox"/> - INTERSTITIAL [-1] <input type="checkbox"/> - INTERMITTENT [-2] <input type="checkbox"/> - VERY FAST [1]
<input type="checkbox"/> - 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input checked="" type="checkbox"/> FAST [1]	
<input type="checkbox"/> - 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input checked="" type="checkbox"/> MODERATE [1]	
<input type="checkbox"/> - 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]	
<input type="checkbox"/> - < 0.2m [POOL=0]			

COMMENTS:

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run
<input checked="" type="checkbox"/> - Best Areas > 10 cm [2]	<input checked="" type="checkbox"/> MAX > 50 [2]	<input checked="" type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> - NONE [2]	<input type="checkbox"/> - MODERATE [0] <input type="checkbox"/> - EXTENSIVE [-1]
<input type="checkbox"/> - Best Areas 5-10 cm [1]	<input type="checkbox"/> - MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> - LOW [1]	
<input type="checkbox"/> - Best Areas < 5 cm		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]		
[RIFFLE=0]				

COMMENTS:

6) GRADIENT (ft/mi): DRAINAGE AREA (sq.mi.): 78.1

%POOL: 80 %GLIDE:
%RIFFLE: 5 %RUN: 15

* Best areas must be large enough to support a population of riffle-obligate species

Macrobenthos Qualitative Sample List

Vial #	ORDER	FAMILY	GENUS	SPECIES	COUNT	TOLERANCE VALUES	FBI	
21	Nematomorpha				4		0.000	Parasite
	Hydracarina- Trembidiformes				1		0.000	Predators/Parasite
23	Tubellaria	Planaria				4	0.000	Omnivore
	Porifera	Spongiidae					0.000	Filters
31	Pelecypoda	Corbiculidae	Corbicula	fluminea		3.2	0.000	Filters
		Dreissenidae	Dreissena	polymorpha			0.000	Filters
		Unionidae	Villosa	iris			0.000	Filters
18		Sphaeriidae			8		0.000	Filters
	Gastropoda	Ancylidae			6		0.000	Scrapers
20		Lymnaeidae			6.9		0.000	Scrapers
		Lymnaeidae	Fossaria		6		0.000	Scrapers
19		Physidae			2	8	0.174	Scrapers
		Physidae	Physella		8		0.000	Scrapers
		Planorbidae			7		0.000	Scrapers
		Planorbidae	Planorbula		7		0.000	Scrapers
		Pleuroceridae					0.000	Scrapers
		Bitryniidae	Bitrynia	tentaculata			0.000	Scrapers
1	Annelida	Hirudinea				10	0.000	Gathers
25		Oligochaeta			3		0.000	Gathers
26	Decapoda				4	4	0.174	Shredders
17	Amphipoda	Aesellidae			8		0.000	Shredders
24	Isopoda				8		0.000	Scavengers
	Ostracoda				8		0.000	Scavengers
	Ephemeroptera	Caenidae			7		0.000	Gathers
13		Caenidae	Caenis		1	3.1	0.034	Gathers
		Ephemeridae	Hexagenia			3.6	0.000	Gathers
16		Baetidae	Baetis		18	3.1	0.607	Gathers
		Baetidae	Baetis	brunneicollis		4	0.000	Gathers
		Baetidae	Baetis	intercalans		2.7	0.000	Gathers
		Baetidae	Cellbaetis			6.6	0.000	Gathers
14		Heptageniidae	Stenacron			3.1	0.000	Scrapers
		Heptageniidae	Stenacron	gildersleevei		3.1	0.000	Scrapers
		Heptageniidae	Stenonema			4	0.000	Scrapers
		Heptageniidae	Stenonema	exiguum		1.9	0.000	Scrapers
		Leptophlebiidae				2.7	0.000	Gathers
		Siphonuridae				7	0.000	Gathers
		Ephemereidae	Timpanoga			1	0.000	Gathers
		Leptophlebiidae				2	0.000	Gathers
9,9	Coleoptera	Dytiscidae				5	0.000	Predators
37		Gyrinidae				5	0.000	Predators
		Gyrinidae	Dineutus			3.7	0.000	Predators
27,33		Helophidae				7	0.000	Predators
		Dryopidae				5	0.000	Predators
28,32		Elmidae			4	4	0.174	Gathers
		Peaphenidae	Peaphenus			4	0.000	Scrapers
		Hydrophilidae					0.000	Gathers
7		Hydrophilidae	Tropisternus				0.000	Gathers
	Megaloctera	Stalidae				4	0.000	Predators
		Corydidae	Corydalis			4	0.000	Predators
	Trichoptera	Brachycentridae	Brachycentrus			1	0.000	Filters
		Helicopsychidae	Helicopsyche			3	0.000	Scrapers
		Helicopsychidae	Helicopsyche	borealis		3	0.000	Scrapers
16		Hydropsychidae			1	4	0.043	Filters
		Hydropsychidae	Hydropsyche			4	0.000	Filters
		Hydropsychidae	Hydropsyche	bettleri		4	0.000	Filters
		Hydropsychidae	Hydropsyche	scalaris		4	0.000	Filters
		Hydropsychidae	Symphlepsyche			4	0.000	Filters
		Hydroptilidae				4	0.000	Gathers
		Hydroptilidae	Hydroptila			3.2	0.000	Gathers
		Leptoceridae				4	0.000	Shredders
		Leptoceridae	Nectopsyche			4	0.000	Shredders
		Molannidae				6	0.000	Gathers
		Phlebotomidae				3	0.000	Filters
		Phryganeidae	Hagenella			4	0.000	Shredders
		Polyceratomyxidae	Cymellus			6	0.000	Filters
		Psychomyiidae	Lype			2	0.000	Gathers
36	Hemiptera	Belostomatidae					0.000	Predators
		Belostomatidae	Belostoma				0.000	Predators
34		Corixidae				10	0.000	Predators
3		Gerridae				5	0.000	Predators
		Gerridae	Trapobates			5	0.000	Predators
		Notonectidae	Notonecta				0.000	Predators
		Nepidae					0.000	Predators
		Nepidae	Ranatra				0.000	Predators
	Recoptera	Perleidae	Perlesta			1	0.000	Predators
		Perleidae	Neoperla			1	0.000	Predators
		Chloroperlidae				1	0.000	Predators
	Odonata-Anisoptera	Aeshnidae				3	0.000	Predators
		Aeshnidae	Boyeria			3	0.000	Predators
		Gomphidae				1	0.000	Predators
		Cordulegastriidae				3	0.000	Predators
22		Cordulidae			1	5	0.054	Predators
		Libellulidae				9	0.000	Predators
	Odonata-Zygoptera	Calopterygidae				5	0.000	Predators
4		Calopterygidae	Calopteryx		5	3.7	0.201	Predators
6		Coenagrionidae			7	6.1	0.464	Predators
5		Coenagrionidae	Argia			5.1	0.000	Predators
30		Coenagrionidae	Engallagrion			1	0.000	Predators
		Leptoceridae				6	0.000	Predators
	Diptera	Ceratomyxidae				5.7	0.000	Gathers
11		Blood-red Chironomidae			5	8.1	0.440	Gathers
12		Other Chironomidae			38	6	2.478	Gathers
35		Culicidae				8	0.000	Shredders
10		Simuliidae			6	6	0.391	Filters
2		Tipulidae				3	0.000	Predators
		Stratiomyidae				8	0.000	Gathers
29		Tabanidae				6	0.000	Predators

TAXA RICHNESS 15
 FI 5.23E
 Scraper/Filter 0.25
 EPT/Chironomidae 0.46
 % Contribution of Dominant Taxa 0.38
 EPT Index 3.00
 Community Similarity Indices 0.53
 CPOM 0.040
 Total Number Collected 100
 total shredders 4

Comm. Loss = 0.467
 Jaccard Coef. = 0.475

page of

Enter Family and/or Genus and Species name on blank line.

Taxonomic certainty rating (TCR) 1=5:1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I=immature; P=pupa; A=adult TI=Taxonomists initials

Total No. Taxes

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Rush Creek</u>		LOCATION <u>Harmonie State Park</u>	
STATION # <u>1</u> RIVERMILE		STREAM CLASS	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS <u>EB, WGL, AS</u>			LOT NUMBER
FORM COMPLETED BY		DATE <u>10/12/04</u> TIME <u>9:30</u> <u>AM</u> PM	REASON FOR SURVEY

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>10</u> % <input checked="" type="checkbox"/> Snags <u>2</u> % <input type="checkbox"/> Vegetated Banks <u>2</u> % <input checked="" type="checkbox"/> Sand <u>20</u> % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other (_____) _____ %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input checked="" type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	<u>2</u>	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	0	1	<u>2</u>	3	4	Macroinvertebrates	0	1	2	<u>3</u>	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	0	1	<u>2</u>	3	4

Darter

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Rush Creek</u>		LOCATION <u>Harmonia State Park</u>
STATION # <u>1</u>	RIVERMILE	STREAM CLASS
LAT _____	LONG _____	RIVER BASIN
STORET #		AGENCY
INVESTIGATORS <u>ESB, WGL, AS</u>		
FORM COMPLETED BY _____		DATE <u>10/13/04</u> TIME <u>9:30</u> <u>AM</u> PM
REASON FOR SURVEY _____		

and 10/13/04 at 16:00

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <u>1/4 inch previous night, currently drizzling</u>
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % _____ <input type="checkbox"/>	Air Temperature <u>17</u> °C Other _____

SITE LOCATION/MAP	Draw a map of the site and indicate the areas sampled (or attach a photograph)			DEPTH (ft)	VELOCITY (ft/sec)
DFLB(A) <u>D_{FT}</u>	DFLB(A)	DEPTH (ft)	Velocity (ft/sec)	DFLB (ft)	DEPTH
2.0 0.4	1.0	0.1	0.05	1.0	0.1
4.0 0.3	2.0	0.1	0.01	2.0	0.2
6.0 0.4	3.0	0.2	0.11	3.0	0.2
8.0 0.5	4.0	0.2	0.19	4.0	0.2
10.0 0.2	5.0	0.3	0.06	5.0	0.2
12.0 0.4	6.0	0.3	0.04	6.0	0.2
14.0 0.4	7.0	0.4	0.03	7.0	0.3
16.0 0.6	8.0	0.4	0.02	8.0	0.3
18.0 0.8	9.0	0.4	0.16	9.0	0.2
20.0 0.5	10.0	0.3	0.34	10.0	0.2
22.0 0.2	11.0	0.3	0.08	11.0	0.2
24 - SHORE	12.0	0.3		12.0	0.2
	13.0	0.3		13.0	0.2
	14.0	0.2		14.0	0.2
	15.0	0.2		15.0	0.3
	16.0	0.2		16.0	0.2
	17.0	0.1		17.0	0.2
	18.0	0.1		18.0	0.2
	19.0	0.1		19.0	0.2
	20.0	0.1		20.0	0.2
	21.0	0.1		21.0	0.2
	22.0	0.1		22.0	0.2
	23.0	0.1		23.0	0.2
	24.0	0.1		24.0	0.2
	25.0	0.1		25.0	0.2
	26.0	0.1		26.0	0.2
	27.0	0.1		27.0	0.2
	28.0	0.1		28.0	0.2
	29.0	0.1		29.0	0.2
	30.0	0.1		30.0	0.2
	31.0	0.1		31.0	0.2
	32.0	0.1		32.0	0.2
	33.0	0.1		33.0	0.2
	34.0	0.1		34.0	0.2
	35.0	0.1		35.0	0.2
	36.0	0.1		36.0	0.2
	37.0	0.1		37.0	0.2
	38.0	0.1		38.0	0.2
	39.0	0.1		39.0	0.2
	40.0	0.1		40.0	0.2
	41.0	0.1		41.0	0.2
	42.0	0.1		42.0	0.2
	43.0	0.1		43.0	0.2
	44.0	0.1		44.0	0.2
	45.0	0.1		45.0	0.2
	46.0	0.1		46.0	0.2
	47.0	0.1		47.0	0.2
	48.0	0.1		48.0	0.2
	49.0	0.1		49.0	0.2
	50.0	0.1		50.0	0.2
	51.0	0.1		51.0	0.2
	52.0	0.1		52.0	0.2
	53.0	0.1		53.0	0.2
	54.0	0.1		54.0	0.2
	55.0	0.1		55.0	0.2
	56.0	0.1		56.0	0.2
	57.0	0.1		57.0	0.2
	58.0	0.1		58.0	0.2
	59.0	0.1		59.0	0.2
	60.0	0.1		60.0	0.2
	61.0	0.1		61.0	0.2
	62.0	0.1		62.0	0.2
	63.0	0.1		63.0	0.2
	64.0	0.1		64.0	0.2
	65.0	0.1		65.0	0.2
	66.0	0.1		66.0	0.2
	67.0	0.1		67.0	0.2
	68.0	0.1		68.0	0.2
	69.0	0.1		69.0	0.2
	70.0	0.1		70.0	0.2
	71.0	0.1		71.0	0.2
	72.0	0.1		72.0	0.2
	73.0	0.1		73.0	0.2
	74.0	0.1		74.0	0.2
	75.0	0.1		75.0	0.2
	76.0	0.1		76.0	0.2
	77.0	0.1		77.0	0.2
	78.0	0.1		78.0	0.2
	79.0	0.1		79.0	0.2
	80.0	0.1		80.0	0.2
	81.0	0.1		81.0	0.2
	82.0	0.1		82.0	0.2
	83.0	0.1		83.0	0.2
	84.0	0.1		84.0	0.2
	85.0	0.1		85.0	0.2
	86.0	0.1		86.0	0.2
	87.0	0.1		87.0	0.2
	88.0	0.1		88.0	0.2
	89.0	0.1		89.0	0.2
	90.0	0.1		90.0	0.2
	91.0	0.1		91.0	0.2
	92.0	0.1		92.0	0.2
	93.0	0.1		93.0	0.2
	94.0	0.1		94.0	0.2
	95.0	0.1		95.0	0.2
	96.0	0.1		96.0	0.2
	97.0	0.1		97.0	0.2
	98.0	0.1		98.0	0.2
	99.0	0.1		99.0	0.2
	100.0	0.1		100.0	0.2

(BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input checked="" type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Red Maple</u>	
INSTREAM FEATURES	Estimated Reach Length <u>100</u> m Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Estimated Stream Width <u>10</u> m Sampling Reach Area _____ m ² High Water Mark _____ m Area in km² (m² x 1000) _____ km ² Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____ % <input type="checkbox"/> Run _____ % <input type="checkbox"/> Pool _____ % Estimated Stream Depth <u>.5</u> m Surface Velocity _____ m/sec Channelized <input type="checkbox"/> Yes <input type="checkbox"/> No (at thalweg) Dam Present <input type="checkbox"/> Yes <input type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD _____ m ³ Density of LWD _____ m ³ /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>10</u> %	
WATER QUALITY * = 10/12/04 * = 10/13/04	Temperature <u>58.2°F @ 14.6°C</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Specific Conductance <u>534.3 µmhos</u> @ Dissolved Oxygen <u>7.85 mg/L</u> @ pH <u>7.61</u> @ Turbidity <u>5.8</u> * WQ Instrument Used _____ <u>ORP = +290</u> @ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	15	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	30			
Sand	0.06-2mm (gritty)	35	Marl	grey, shell fragments	2
Silt	0.004-0.06 mm	10			
Clay	< 0.004 mm (slick)	5			

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Rush Creek</u>	LOCATION <u>Harmonie State Park</u>	
STATION # <u>1</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>ESB, WGL</u>		
FORM COMPLETED BY <u>ESB</u>	DATE <u>10/13/04</u> TIME <u>10:00</u> AM PM	REASON FOR SURVEY

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE <u>13</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE <u>10</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE <u>10</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>18</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.	
SCORE <u>18</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>3</u> (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
SCORE <u>3</u> (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0		
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE <u>1</u> (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
SCORE <u>3</u> (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0		
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>1</u> (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
SCORE <u>1</u> (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0		

Total Score 103

River Code: RM: Stream: Rush Creek
 Date: 10/12/04 Location: Station 1 Harmonie State Park
 Scorers Full Name: Ed Belmonte Affiliation: V3

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE	POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN	SUBSTRATE QUALITY
<input type="checkbox"/> BLDR/SLBS [10]	<input checked="" type="checkbox"/> GRAVEL [7]	<u>10</u> <u>60</u>	Check ONE (OR 2 & AVERAGE)	Check ONE (OR 2 & AVERAGE)
<input type="checkbox"/> BOULDER [9]	<input checked="" type="checkbox"/> SAND [6]	<u>30</u> <u>20</u>	<input type="checkbox"/> LIMESTONE [1]	<input type="checkbox"/> SILT: <input type="checkbox"/> SILT HEAVY [-2]
<input type="checkbox"/> COBBLE [8]	<input type="checkbox"/> BEDROCK [5]		<input checked="" type="checkbox"/> TILLS [1]	<input type="checkbox"/> SILT MODERATE [-1]
<input type="checkbox"/> HARDPAN [4]	<input type="checkbox"/> DETRITUS [3]		<input type="checkbox"/> WETLANDS [0]	<input checked="" type="checkbox"/> SILT NORMAL [0]
<input type="checkbox"/> MUCK [2]	<input type="checkbox"/> ARTIFICIAL [0]		<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> SILT [2]	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SANDSTONE [0]	<input type="checkbox"/> EXTENSIVE [-2]
			<input type="checkbox"/> RIP/RAP [0]	<input type="checkbox"/> MODERATE [-1]
			<input type="checkbox"/> LACUSTRINE [0]	<input checked="" type="checkbox"/> NORMAL [0]
			<input type="checkbox"/> SHALE [-1]	<input type="checkbox"/> NONE [1]
			<input type="checkbox"/> COAL FINES [-2]	

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]
 (High Quality Only, Score 5 or >)

COMMENTS: _____

Substrate
16
 Max 20

2] INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur	AMOUNT: (Check ONLY One or check 2 and AVERAGE)
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> SPARSE 5-25% [3]
<input checked="" type="checkbox"/> ROOTMATS [1]	<input type="checkbox"/> NEARLY ABSENT < 5% [1]
<input checked="" type="checkbox"/> POOLS > 70 cm [2]	
<input checked="" type="checkbox"/> ROOTWADS [1]	
<input checked="" type="checkbox"/> BOULDERS [1]	
<input type="checkbox"/> OXBOWS, BACKWATERS [1]	
<input type="checkbox"/> AQUATIC MACROPHYTES [1]	
<input type="checkbox"/> LOGS OR WOODY DEBRIS [1]	

COMMENTS: _____

Cover
15
 Max 20

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER
<input checked="" type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING <input type="checkbox"/> IMPOUND.
<input checked="" type="checkbox"/> MODERATE [3]	<input checked="" type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION <input type="checkbox"/> ISLANDS
<input type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input checked="" type="checkbox"/> RECOVERING [3]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> CANOPY REMOVAL <input type="checkbox"/> LEVEED
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING <input type="checkbox"/> BANK SHAPING
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS

COMMENTS: _____

Channel
13
 Max 20

4]. RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) ☒ River Right Looking Downstream

RIPARIAN WIDTH	FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)	BANK EROSION
L R (Per Bank)	L R (Most Predominant Per Bank)	L R (Per Bank)
<input checked="" type="checkbox"/> WIDE > 50m [4]	<input checked="" type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> NONE/LITTLE [3]
<input checked="" type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input checked="" type="checkbox"/> MODERATE [2]
<input checked="" type="checkbox"/> NARROW 5-10 m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input type="checkbox"/> HEAVY/SEVERE [1]
<input checked="" type="checkbox"/> VERY NARROW < 5 m [1]	<input type="checkbox"/> FENCED PASTURE [1]	
<input type="checkbox"/> NONE [0]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	
	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	
	<input type="checkbox"/> OPEN PASTURE, ROWCROP [0]	
	<input type="checkbox"/> MINING/CONSTRUCTION [0]	

COMMENTS: _____

Riparian
6
 Max 10

5.] POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)	MORPHOLOGY (Check 1 or 2 & AVERAGE)	CURRENT VELOCITY (Check All That Apply)
<input type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]
<input type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> TORRENTIAL [-1]
<input checked="" type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input type="checkbox"/> FAST [1]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> MODERATE [1]
<input type="checkbox"/> < 0.2m [POOL=0]		<input checked="" type="checkbox"/> SLOW [1]
		<input type="checkbox"/> INTERSTITIAL [-1]
		<input type="checkbox"/> INTERMITTENT [-2]
		<input type="checkbox"/> VERY FAST [1]

COMMENTS: _____

Pool/Current
6
 Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]
<input type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input checked="" type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input checked="" type="checkbox"/> LOW [1]
<input checked="" type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]
			<input type="checkbox"/> EXTENSIVE [-1]
		<input type="checkbox"/> NO RIFFLE [Metric=0]	

COMMENTS: _____

Riffle/Run
3 = 59
 Max 8
 Gradient
6
 Max 10

6] GRADIENT (ft/mi): _____ DRAINAGE AREA (sq.mi.): 9.2

%POOL: 70 %GLIDE: —
 %RIFFLE: 10 %RUN: 20

* Best areas must be large enough to support a population of riffle-obligate species

Barr Creek Final Water Quality Monitoring Study - October 12, 2004 - Station 1, Rush Creek, Harmonie State Park
Reference Station for Barr Creek Watershed, Final Water Quality Monitoring Study

Macrobenthos Qualitative Sample List

Vial #

ORDER	FAMILY	GENUS	SPECIES	COUNT	TOLERANCE VALUES	FBI
21	Nematomorpha					0.000 Parasite
	Hydracarina- Trembidiformes					0.000 Predators/Parasite
23	Tubellaria	Planaria			4	0.000 Filters
	Porifera	Spongiidae				0.000 Filters
31	Polycyoda	Corbiculidae	Corbicula fluminea		3.2	0.000 Filters
		Dreissenidae	Dreissena polymorpha			0.000 Filters
		Unionidae	Villosa iris			0.000 Filters
18		Sphaeriidae		6	8	0.480 Filters
	Gastropoda	Ancylidae			6	0.000 Scrapers
20		Lymnaeidae		1	6.9	0.069 Scrapers
		Lymnaeidae	Fossaria		6	0.000 Scrapers
19		Physidae			8	0.000 Scrapers
		Physidae	Physella		8	0.000 Scrapers
		Planorbidae			7	0.000 Scrapers
		Planorbidae	Planorbula		7	0.000 Scrapers
		Pleuroceridae				0.000 Scrapers
		Bithyniidae	Bithynia tentaculata			0.000 Scrapers
1	Annelida	Hirudinea		1	10	0.100 Gathers
25		Oligochaeta				0.000 Gathers
26	Decapoda				8	0.000 Predators
17	Amphipoda			3	4	0.120 Shredders
24	Isopoda	Aeolidae		2	8	0.160 Shredders
	Ostracoda				8	0.000 Scavengers
	Ephemeroptera	Caenidae			7	0.000 Gathers
13		Caenidae	Caenis		3.1	0.000 Gathers
		Ephemeridae	Hexagenia		3.6	0.000 Gathers
15		Baetidae	Baetis	12	3.1	0.372 Gathers
		Baetidae	Baetis brunneicolor		4	0.000 Gathers
		Baetidae	Baetis intercalaris		2.7	0.000 Gathers
		Baetidae	Callibaetis		5.6	0.000 Gathers
14		Heptageniidae	Stenacron		3.1	0.000 Scrapers
		Heptageniidae	Stenacron gidersleevei		3.1	0.000 Scrapers
		Heptageniidae	Stenonema		4	0.000 Scrapers
		Heptageniidae	Stenonema exiguum		1.9	0.000 Scrapers
		Isonychidae	Isonychia		2	0.000 Filters
		Leptohyphidae	Tricorythodes		2.7	0.000 Gathers
		Siphonuridae			7	0.000 Gathers
		Ephemerellidae	Timpanoga		1	0.000 Gathers
		Leptophlebiidae			2	0.000 Gathers
8,9	Coleoptera	Dytiscidae			5	0.000 Predators
37		Gyrinidae			5	0.000 Predators
		Gyrinidae	Dineutus		3.7	0.000 Predators
27,33		Helophidae			7	0.000 Predators
		Dryopidae			5	0.000 Predators
28,32		Elmidae			4	0.000 Gathers
		Psephenidae	Psephenus		4	0.000 Scrapers
		Hydrophilidae				0.000 Gathers
7		Hydrophilidae	Tropisternus			0.000 Gathers
	Megaloptera	Sialidae			4	0.000 Predators
		Corydalidae	Corydalus		4	0.000 Predators
	Trichoptera	Brachycentridae	Brachycentrus		1	0.000 Filters
		Helicopsychidae	Helicopsyche		3	0.000 Scrapers
		Helicopsychidae	Helicopsyche borealis		3	0.000 Scrapers
16		Hydropsychidae		13	4	0.520 Filters
		Hydropsychidae	Hydropsyche		4	0.000 Filters
		Hydropsychidae	Hydropsyche batteni		4	0.000 Filters
		Hydropsychidae	Hydropsyche scalaris		4	0.000 Filters
		Hydropsychidae	Symphlopsyche		4	0.000 Filters
		Hydroptilidae			4	0.000 Gathers
		Hydroptilidae	Hydroptila		3.2	0.000 Gathers
		Leptoceridae			4	0.000 Shredders
		Leptoceridae	Nectopsyche		4	0.000 Shredders
		Molannidae			6	0.000 Gathers
		Philopotamidae			3	0.000 Filters
		Phryganeidae	Hagenella		4	0.000 Shredders
		Polychaetopodidae	Cymellus		6	0.000 Filters
		Psychomyiidae	Lyte		2	0.000 Gathers
36	Hemiptera	Belostomatidae				0.000 Predators
		Belostomatidae	Belostoma			0.000 Predators
34		Corixidae			10	0.000 Predators
3		Gerridae			5	0.000 Predators
		Gerridae	Trepobates		5	0.000 Predators
		Notonectidae	Notonecta			0.000 Predators
		Nepidae				0.000 Predators
		Nepidae	Ranatra			0.000 Predators
	Plecoptera	Perlidae	Parletta		1	0.000 Predators
		Perlidae	Neoperla		1	0.000 Predators
		Chloroperlidae			1	0.000 Predators
	Odonata-Anisoptera	Aeshnidae			3	0.000 Predators
		Aeshnidae	Boyeria		3	0.000 Predators
		Gomphidae			1	0.000 Predators
		Cordulegastridae			3	0.000 Predators
22		Cordulidae			5	0.000 Predators
		Libellulidae			9	0.000 Predators
	Odonata-Zygoptera	Calopterygidae			5	0.000 Predators
4		Calopterygidae	Calopteryx	2	0.074	0.074 Predator
6		Coenagrionidae			6.1	0.000 Predator
		Coenagrionidae	Argia		5.1	0.000 Predators
30		Coenagrionidae	Engallagma	3	9	0.270 Predators
		Lestidae			9	0.000 Predators
		Ceratopogonidae			5.7	0.000 Gathers
11	Diptera	Blood-red Chironomidae		3	8.1	0.243 Gathers
12		Other Chironomidae		8	6	0.480 Gathers
35		Culicidae		1	6	0.080 Shredders
10		Simuliidae		33	6	1.980 Filters
2		Tipulidae		12	3	0.360 Predators
		Stratiomyidae			5	0.000 Gathers
25		Tsabanidae			6	0.000 Predator

TAXA RICHNESS

FBI 14
FBI 5.308
Scrapper/Filter 0.019
EPT/Chironomidae 2.273
% Contribution of Dominant Taxa 0.330
EPT Index 2.000
Community Similarity Indices 0.000
CPOM 1.000
Total Number Collected 0.060
100

Comm. Loss = 0
Jaccard Coef. = 1

total shredders

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

STREAM NAME <u>Bart Creek</u>		LOCATION <u>County Line Rd</u>	
STATION # <u>2</u> RIVERMILE		STREAM CLASS	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
COLLECTED BY <u>EJB, WGL, ARS</u> DATE <u>10/13/04</u>		LOT #	
TAXONOMIST <u>EJB, WGL</u> DATE		SUBSAMPLE TARGET <input type="checkbox"/> 100 <input type="checkbox"/> 200 <input type="checkbox"/> 300 <input type="checkbox"/> Other _____	

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR
Oligochaeta					Megaloptera				
	(25) 20	A	WGL	1					
Hirudinea					Coleoptera		(8)	A	WGL
					Larvae	1	(1)	F	WGL
Isopoda					Hydroptilidae	1	(1)	A	WGL
Amphipoda	1	(2)	A	WGL	Diptera		(3)	I	WGL
					larvae	1			
Decapoda					Culicidae	1	(2)	F	WGL
Ephemeroptera									
Beetle		(4)	F	WGL	Gastropoda		(13)	A	WGL
					Physidae				
					Pelecypoda		(7)	A	WGL
Plecoptera									
					Other				
					Coenagrionidae				
					Odontet		(5)	F	WGL
Trichoptera									
					Coenagrionidae				
					Argia		(16)	F	WGL
					Enallagma		(19)	F	WGL
Hemiptera									
Water Strider	1	(1)	A	WGL					
Water Boatman	1	(1)	A	WGL					

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms

117

Total No. Taxa

114

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Barr Creek</u>	LOCATION <u>County Line Rd</u>	
STATION # <u>2</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>EDB, WGL, ARS</u>	LOT NUMBER	
FORM COMPLETED BY <u>EDB</u>	DATE <u>10/13/04</u> TIME <u>13:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>5</u> % <input checked="" type="checkbox"/> Snags <u>5</u> % <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> % <input checked="" type="checkbox"/> Sand <u>30</u> % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other () _____ %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>10</u> <input checked="" type="checkbox"/> Snags <u>10</u> <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> <input checked="" type="checkbox"/> Sand <u>10</u> <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other () _____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	<u>2</u>	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	0	1	2	<u>3</u>	4	Macroinvertebrates	0	1	<u>2</u>	3	4
Macrophytes	0	<u>1</u>	<u>2</u>	3	4	Fish	0	1	2	<u>3</u>	4

Yellow Bullhead

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Barr Creek</u>		LOCATION <u>County Line Rd</u>	
STATION # <u>2</u> RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>EJB, WGL</u>			
FORM COMPLETED BY <u>EJB</u>		DATE <u>10/13/04</u> TIME <u>13:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY _____

WEATHER CONDITIONS		Now		Past 24 hours	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No																																																																																																												
		<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input type="checkbox"/> clear/sunny		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %	Air Temperature <u>15</u> °C Other _____																																																																																																												
SITE LOCATION/MAP		Draw a map of the site and indicate the areas sampled (or attach a photograph)																																																																																																															
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DFLB (ft)</th> <th>Depth (ft)</th> <th>Velocity (ft/sec)</th> <th>DFLB (ft)</th> <th>Depth (ft)</th> <th>Velocity (ft/sec)</th> </tr> </thead> <tbody> <tr><td>1.0</td><td>0.3</td><td>0.02</td><td>1.0</td><td>0.8</td><td>0.01</td></tr> <tr><td>2.0</td><td>0.6</td><td>0.04</td><td>2.0</td><td>0.8</td><td>0.05</td></tr> <tr><td>3.0</td><td>0.6</td><td>0.05</td><td>3.0</td><td>1.0</td><td>0.07</td></tr> <tr><td>4.0</td><td>0.7</td><td>0.04</td><td>4.0</td><td>1.1</td><td>0.07</td></tr> <tr><td>5.0</td><td>0.8</td><td>0.04</td><td>5.0</td><td>1.0</td><td>0.04</td></tr> <tr><td>6.0</td><td>0.9</td><td>0.05</td><td>6.0</td><td>1.1</td><td>0.03</td></tr> <tr><td>7.0</td><td>1.0</td><td>0.06</td><td>7.0</td><td>1.1</td><td>0.03</td></tr> <tr><td>8.0</td><td>1.0</td><td>0.07</td><td>8.0</td><td>1.1</td><td>0.02</td></tr> <tr><td>9.0</td><td>1.1</td><td>0.04</td><td>9.0</td><td>1.3</td><td>0.04</td></tr> <tr><td>10.0</td><td>1.0</td><td>0.05</td><td>10.0</td><td>1.0</td><td>0.07</td></tr> <tr><td>11.0</td><td>0.9</td><td>0.08</td><td>11.0</td><td>1.1</td><td>0.09</td></tr> <tr><td>12.0</td><td>1.1</td><td>0.10</td><td>12.0</td><td>1.3</td><td>0.05</td></tr> <tr><td>13.0</td><td>1.0</td><td>0.11</td><td>13.0</td><td>1.2</td><td>0.05</td></tr> <tr><td>14.0</td><td>0.9</td><td>0.04</td><td>14.0</td><td>0.9</td><td>0.13</td></tr> <tr><td>15.0</td><td>0.9</td><td>0.01</td><td>15.0</td><td>0.7</td><td>0.07</td></tr> <tr><td>16.0</td><td>0.5</td><td>0.02</td><td>16.0</td><td>RB</td><td></td></tr> <tr><td>16.5</td><td>RB</td><td></td><td></td><td></td><td></td></tr> </tbody> </table>						DFLB (ft)	Depth (ft)	Velocity (ft/sec)	DFLB (ft)	Depth (ft)	Velocity (ft/sec)	1.0	0.3	0.02	1.0	0.8	0.01	2.0	0.6	0.04	2.0	0.8	0.05	3.0	0.6	0.05	3.0	1.0	0.07	4.0	0.7	0.04	4.0	1.1	0.07	5.0	0.8	0.04	5.0	1.0	0.04	6.0	0.9	0.05	6.0	1.1	0.03	7.0	1.0	0.06	7.0	1.1	0.03	8.0	1.0	0.07	8.0	1.1	0.02	9.0	1.1	0.04	9.0	1.3	0.04	10.0	1.0	0.05	10.0	1.0	0.07	11.0	0.9	0.08	11.0	1.1	0.09	12.0	1.1	0.10	12.0	1.3	0.05	13.0	1.0	0.11	13.0	1.2	0.05	14.0	0.9	0.04	14.0	0.9	0.13	15.0	0.9	0.01	15.0	0.7	0.07	16.0	0.5	0.02	16.0	RB		16.5	RB		
DFLB (ft)	Depth (ft)	Velocity (ft/sec)	DFLB (ft)	Depth (ft)	Velocity (ft/sec)																																																																																																												
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8.0	1.0	0.07	8.0	1.1	0.02																																																																																																												
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10.0	1.0	0.05	10.0	1.0	0.07																																																																																																												
11.0	0.9	0.08	11.0	1.1	0.09																																																																																																												
12.0	1.1	0.10	12.0	1.3	0.05																																																																																																												
13.0	1.0	0.11	13.0	1.2	0.05																																																																																																												
14.0	0.9	0.04	14.0	0.9	0.13																																																																																																												
15.0	0.9	0.01	15.0	0.7	0.07																																																																																																												
16.0	0.5	0.02	16.0	RB																																																																																																													
16.5	RB																																																																																																																
STREAM CHARACTERIZATION		Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal		Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater																																																																																																													
		Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____		Catchment Area _____ km²																																																																																																													

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Red Canary Grass</u>		
INSTREAM FEATURES	Estimated Reach Length <u>100</u> m Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Estimated Stream Width <u>2</u> m High Water Mark <u>4</u> m Sampling Reach Area _____ m ² Area in km ² (m ² x 1000) _____ km ² Estimated Stream Depth <u>0.2</u> m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>2</u> % <input checked="" type="checkbox"/> Run <u>2</u> % <input checked="" type="checkbox"/> Pool <u>96</u> % Surface Velocity _____ m/sec Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (at thalweg) Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD <u>2</u> m ² Density of LWD _____ m ² /km ² (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input checked="" type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present <u>Filamentous Algae</u> Portion of the reach with aquatic vegetation <u>10</u> %		
WATER QUALITY	Temperature <u>59.8° F 15.4° C</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Specific Conductance <u>815.6</u> μ mhos Dissolved Oxygen <u>8.65</u> mg/L Water Surface Oils <input type="checkbox"/> Slick <input checked="" type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____ pH <u>7.54</u> Turbidity <u>14</u> Turbidity (if not measured) WQ Instrument Used <u>Troll 9000 LaMotte</u> <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input checked="" type="checkbox"/> Turbid <u>ORP = +246</u> <u>2020</u> <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____		
SEDIMENT/ SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")	5	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	10			
Sand	0.06-2mm (gritty)	20	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	45			
Clay	< 0.004 mm (slick)	20			

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Barr Creek</u>	LOCATION <u>County Line Rd</u>	
STATION # <u>2</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>EDB, WGL, ARS</u>		
FORM COMPLETED BY <u>EDB</u>	DATE <u>10/13/04</u> TIME <u>14:00</u> AM (PM)	REASON FOR SURVEY

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE <u>3</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	10 9 8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8 9 10
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE <u>6</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	10 9 8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8 9 10
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE <u>11</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	10 9 8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8 9 10
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE <u>1</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	10 9 8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8 9 10
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE <u>11</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	10 9 8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8 9 10

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.	
SCORE 3	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream. More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE 3 (LB)	Left Bank 20 19	18 17 16	15 14 13	12 11 10
SCORE 3 (RB)	Right Bank 20 19	18 17 16	15 14 13	12 11 10
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE 1 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 1 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 51



Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

39

River Code: RM: Stream: Barr Creek
Date: 10/13/04 Location: Station 2, County Line Rd
Scorers Full Name: Ed Belmonte Affiliation: V3

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE		POOL RIFFLE SUBSTRATE ORIGIN		SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR /SLBS [10]		<input checked="" type="checkbox"/> GRAVEL [7]	<u>0</u> <u>30</u>	Check ONE (OR 2 & AVERAGE)		Check ONE (OR 2 & AVERAGE)	
<input type="checkbox"/> BOULDER [9]		<input type="checkbox"/> SAND [6]		<input type="checkbox"/> LIMESTONE [1]	SILT:	<input type="checkbox"/> SILT HEAVY [-2]	Substrate <div style="border: 1px solid black; padding: 2px; display: inline-block;">10</div> Max 20
<input type="checkbox"/> COBBLE [8]		<input type="checkbox"/> BEDROCK [5]		<input checked="" type="checkbox"/> TILLS [1]		<input checked="" type="checkbox"/> SILT MODERATE [-1]	
<input type="checkbox"/> HARDPAN [4]		<input type="checkbox"/> DETRITUS [3]		<input type="checkbox"/> WETLANDS [0]		<input type="checkbox"/> SILT NORMAL [0]	
<input type="checkbox"/> MUCK [2]		<input type="checkbox"/> ARTIFICIAL [0]		<input type="checkbox"/> HARDPAN [0]		<input type="checkbox"/> SILT FREE [1]	
<input checked="" type="checkbox"/> SILT [2]	<u>90</u> <u>10</u>	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SANDSTONE [0]	EMBEDDED	<input type="checkbox"/> EXTENSIVE [-2]	
NUMBER OF SUBSTRATE TYPES: (High Quality Only, Score 5 or >)		<input checked="" type="checkbox"/> 4 or More [2]		<input type="checkbox"/> RIP/RAP [0]		NESS:	<input checked="" type="checkbox"/> MODERATE [-1]
		<input type="checkbox"/> 3 or Less [0]		<input type="checkbox"/> LACUSTRINE [0]			<input type="checkbox"/> NORMAL [0]
COMMENTS:				<input type="checkbox"/> SHALE [-1]			<input type="checkbox"/> NONE [1]
				<input type="checkbox"/> COAL FINES [-2]			

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

STRUCTURE		TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)		COVER
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]		<input type="checkbox"/> POOLS > 70 cm [2]		<input type="checkbox"/> OXBOWS, BACKWATERS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]	<div style="border: 1px solid black; padding: 2px; display: inline-block;">6</div> Max 20
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]		<input type="checkbox"/> ROOTWADS [1]		<input type="checkbox"/> AQUATIC MACROPHYTES [1]	<input checked="" type="checkbox"/> MODERATE 25-75% [7]	
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]		<input checked="" type="checkbox"/> BOULDERS [1]		<input type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input checked="" type="checkbox"/> SPARSE 5-25% [3]	
<input type="checkbox"/> ROOTMATS [1]		COMMENTS:			<input checked="" type="checkbox"/> NEARLY ABSENT < 5% [1]	

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER		CHANNEL
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	<input type="checkbox"/> IMPOUND.	<div style="border: 1px solid black; padding: 2px; display: inline-block;">7</div> Max 20
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	<input type="checkbox"/> ISLANDS	
<input checked="" type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input checked="" type="checkbox"/> RECOVERING [3]	<input checked="" type="checkbox"/> LOW [1]	<input checked="" type="checkbox"/> CANOPY REMOVAL	<input type="checkbox"/> LEVEED	
<input type="checkbox"/> NONE [1]	<input checked="" type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	<input type="checkbox"/> BANK SHAPING	
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS		

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION		RIPARIAN
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)			<div style="border: 1px solid black; padding: 2px; display: inline-block;">2</div> Max 10
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input type="checkbox"/> NONE/LITTLE [3]			
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input type="checkbox"/> MODERATE [2]			
<input type="checkbox"/> NARROW 5-10 m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input checked="" type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<input checked="" type="checkbox"/> HEAVY/SEVERE [1]			
<input checked="" type="checkbox"/> VERY NARROW < 5 m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]				
<input type="checkbox"/> NONE [0]						

COMMENTS:

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES!]	POOL/CURRENT	
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">7</div> Max 12	
<input type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]		<input type="checkbox"/> TORRENTIAL [-1]
<input checked="" type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]		<input type="checkbox"/> INTERSTITIAL [-1]
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input type="checkbox"/> MODERATE [1]		<input type="checkbox"/> INTERMITTENT [-2]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]		<input type="checkbox"/> VERY FAST [1]
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS:			

RIFFLE DEPTH

- ☐ Best Areas > 10 cm [2]
☐ Best Areas 5-10 cm [1]
☒ Best Areas < 5 cm [RIFFLE=0]

COMMENTS:

RUN DEPTH

- ☐ MAX > 50 [2]
☒ MAX < 50 [1]

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE/RUN SUBSTRATE

- ☐ STABLE (e.g., Cobble, Boulder) [2]
☐ MOD. STABLE (e.g., Large Gravel) [1]
☒ UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐ NONE [2]
☐ LOW [1]
☒ MODERATE [0]
☐ EXTENSIVE [-1]

☐ NO RIFFLE [Metric=0]

Riffle/Run

1

Max 8

Gradient

6

Max 106] GRADIENT (ft/mi): DRAINAGE AREA (sq.mi.): 9.7%POOL: 96 %GLIDE: %RIFFLE: 2 %RUN: 2

* Best areas must be large enough to support a population of riffle-obligate species

Macrobenthos Qualitative Sample List

Vial #

ORDER	FAMILY	GENUS	SPECIES	COUNT	TOLERANCE VALUES	FBI	
21	Nematomorpha					0.000	Parasite
	Hydracarina- Trombidiformes					0.000	Predators/Parasite
23	Tubellaria	Planaria			4	0.000	Omnivore
	Porifera	Spongiidae				0.000	Filters
31	Polycypoda	Corbiculidae	Corbicula fluminea	7	3.2	0.295	Filters
		Dreissenidae	Dreissena polymorpha			0.000	Filters
		Unionidae	Villosa iris			0.000	Filters
18		Sphaeriidae			8	0.000	Filters
	Gastropoda	Ancylidae			6	0.000	Scrapers
20		Lymnaeidae			6.9	0.000	Scrapers
		Lymnaeidae	Fossaria		6	0.000	Scrapers
19		Physidae	Physella	13	8	1.368	Scrapers
		Planorbidae			8	0.000	Scrapers
		Planorbidae	Planorbula		7	0.000	Scrapers
		Pleurocandidae			7	0.000	Scrapers
		Bithyniidae	Bithynia tentaculata			0.000	Scrapers
1	Annelida	Hirudinea			10	0.000	Gathers
25		Oligochaeta		23		0.000	Gathers
26	Decapoda				8	0.000	Predators
17	Amphipoda			2	4	0.105	Shredders
24	Isoptoda	Asellidae			8	0.000	Shredders
	Ostracoda				8	0.000	Scavengers
	Ephemeroptera	Caenidae			7	0.000	Gathers
13		Caenidae	Caenis		3.1	0.000	Gathers
		Ephemeridae	Hexagenia		3.6	0.000	Gathers
15		Baetidae	Baetis	4	3.1	0.163	Gathers
		Baetidae	Baetis brunneicolor		4	0.000	Gathers
		Baetidae	Baetis intercalaris		2.7	0.000	Gathers
		Baetidae	Calibaetis		5.6	0.000	Gathers
14		Heptageniidae	Stenacron		3.1	0.000	Scrapers
		Heptageniidae	Stenacron gikersleevei		3.1	0.000	Scrapers
		Heptageniidae	Stenonema		4	0.000	Scrapers
		Heptageniidae	Stenonema exiguum		1.9	0.000	Scrapers
		Leptophlebiidae	Leptophlebia		2	0.000	Filters
		Leptophlebiidae	Tricorythodes		2.7	0.000	Gathers
		Siphonuridae			7	0.000	Gathers
		Ephemerellidae	Timpanoga		1	0.000	Gathers
8,9	Coleoptera	Leptophlebiidae			2	0.000	Gathers
37		Dytiscidae			5	0.000	Predators
		Gyrinidae			5	0.000	Predators
		Gyrinidae	Dineutus		3.7	0.000	Predators
27,33		Halpidae		1	7	0.092	Predators
		Dryopidae			5	0.000	Predators
28,32		Elmidae		8	4	0.421	Gathers
		Psephenidae	Psephenus		4	0.000	Scrapers
		Hydrophilidae				0.000	Gathers
7		Hydrophilidae	Tropisternus	1		0.000	Gathers
	Megaloptera	Selidae			4	0.000	Predators
		Corydalidae	Corydalus		4	0.000	Predators
	Trichoptera	Brachycentridae	Brachycentrus		1	0.000	Filters
		Helicopsychidae	Helicopsyche		3	0.000	Scrapers
		Helicopsychidae	Helicopsyche borealis		3	0.000	Scrapers
16		Hydropsychidae			4	0.000	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	Hydropsyche betteni		4	0.000	Filters
		Hydropsychidae	Hydropsyche scalaris		4	0.000	Filters
		Hydropsychidae	Symphlopsyche		4	0.000	Filters
		Hydroptilidae			4	0.000	Gathers
		Hydroptilidae	Hydroptila		3.2	0.000	Gathers
		Leptoceridae			4	0.000	Shredders
		Leptoceridae	Nectopsyche		4	0.000	Shredders
		Molannidae			6	0.000	Gathers
		Philopotamidae			3	0.000	Filters
		Phryganeidae	Hagenella		4	0.000	Shredders
		Polycentropodidae	Cymellus		6	0.000	Filters
		Psychomyiidae	Lype		2	0.000	Gathers
36	Hemiptera	Belostomatidae				0.000	Predators
		Belostomatidae	Belostomat			0.000	Predators
34		Corixidae		1	10	0.132	Predators
3		Gerridae			5	0.000	Predators
		Gerridae	Trepobates		5	0.000	Predators
		Notonectidae	Notonecta			0.000	Predators
		Nepidae				0.000	Predators
		Nepidae	Ranatra			0.000	Predators
	Plecoptera	Perlidae	Perlsta		1	0.000	Predators
		Perlidae	Neoperla		1	0.000	Predators
		Chloroperiidae			1	0.000	Predators
	Odonata-Anisoptera	Aeshnidae			3	0.000	Predators
		Aeshnidae	Boyeria		3	0.000	Predators
		Gomphidae			1	0.000	Predators
		Cordulegastridae			3	0.000	Predators
22		Cordulidae		5	5	0.329	Predators
		Libellulidae			9	0.000	Predators
	Odonata-Zygoptera	Calopterygidae			5	0.000	Predators
4		Calopterygidae	Calopteryx		3.7	0.000	Predators
6		Coenagrionidae			6.1	0.000	Predators
5		Coenagrionidae	Argia	16	5.1	1.074	Predators
30		Coenagrionidae	Engallagma	14	9	1.858	Predators
		Leptidae			9	0.000	Predators
	Diptera	Ceratopogonidae			5.7	0.000	Gathers
		Blood-red Chironomidae		3	8.1	0.320	Gathers
11		Other Chironomidae			6	0.000	Gathers
35		Culicidae		2	6	0.211	Shredders
10		Simuliidae			6	0.000	Filters
2		Tipulidae			3	0.000	Predators
		Stratiomyidae			5	0.000	Gathers
25		Tabanidae			6	0.000	Predators

TAXA RICHNESS

FBI 14
 Scaper/Filter 6.167
 EPT/Chironomidae 1.857
 % Contribution of Dominant Taxa 1.333
 EPT Index 0.236
 Community Similarity Indices 1.000

Comm. Loss = 0.643
 Jaccard Coef. = 0.217

CPOM

0.040
 Total Number Collected 100

total shredders

4

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

page of

STREAM NAME <u>Barr Creek</u>		LOCATION <u>Upstream of Confluence w/ Barr Creek</u>	
STATION # <u>3</u>	RIVERMILE <u> </u>	STREAM CLASS <u> </u>	
LAT <u> </u>	LONG <u> </u>	RIVER BASIN <u> </u>	
STORET # <u> </u>		AGENCY <u> </u>	
COLLECTED BY <u>ESB, WGL</u>		DATE <u>10/13/04</u>	LOT # <u> </u>
TAXONOMIST <u>ESB, WGL</u>		DATE <u> </u>	SUBSAMPLE TARGET <input type="checkbox"/> 100 <input type="checkbox"/> 200 <input type="checkbox"/> 300 <input type="checkbox"/> Other <u> </u>

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR
Oligochaeta					Megaloptera				
Hirudinea					Coleoptera				
Isopoda					Beetles	<u> </u>	<u>1</u>	<u>A</u>	<u>WGL</u>
Amphipoda					Riffle Beetle	<u> </u>	<u>(4)</u>	<u>5</u>	<u>A</u>
Decapoda					Whirling	<u> </u>	<u>1</u>	<u>A</u>	<u>WGL</u>
Ephemeroptera					larvae	<u>1 - Halipididae</u>	<u>(2)</u>	<u>1</u>	<u>I</u>
Baetid	<u> </u>	<u>(2)</u>	<u>1</u>	<u>E</u>	Diptera	<u> </u>	<u>(2)</u>	<u>1</u>	<u>I</u>
Plecoptera					dobsonfly	<u> </u>	<u>(3)</u>	<u>1</u>	<u>I</u>
Trichoptera					Grn Chiron	<u> </u>	<u>(6)</u>	<u>1</u>	<u>I</u>
Hemiptera					BH Red	<u>1</u>	<u>(1)</u>	<u>1</u>	<u>I</u>
water boatman	<u> </u>	<u>(3)</u>	<u>1</u>	<u>A</u>	Gastropoda	<u> </u>	<u>1</u>	<u>A</u>	<u>WGL</u>
water penny					Physidae				
					Pelecypoda				
					Other				
					Horsehair worm	<u> </u>	<u>(3)</u>	<u>1</u>	<u>A</u>
					Coenagrionidae	<u> </u>	<u>(3)</u>	<u>1</u>	<u>A</u>
					Planarian	<u> </u>	<u>(3)</u>	<u>1</u>	<u>A</u>
					Odonata	<u> </u>	<u>(6)</u>	<u>1</u>	<u>I</u>
						<u>(34)</u>	<u>12</u>	<u>I</u>	<u>WGL</u>

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms 1100

Total No. Taxa 15

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Barr Creek</u>	LOCATION <u>Upstream of Confluence w/ Big Creek</u>	
STATION # <u>3</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>EJB, WGL, ARS</u>	LOT NUMBER	
FORM COMPLETED BY <u>EJB</u>	DATE <u>10/13/04</u> TIME <u>09:00</u> <u>AM</u> PM	REASON FOR SURVEY

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____ % <input type="checkbox"/> Snags _____ % <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> % <input checked="" type="checkbox"/> Sand <u>10</u> % <input checked="" type="checkbox"/> Submerged Macrophytes <u>10</u> % <input type="checkbox"/> Other (_____) _____ %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> <input checked="" type="checkbox"/> Sand <u>10</u> <input checked="" type="checkbox"/> Submerged Macrophytes <u>10</u> <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	0	1	<u>2</u>	3	4	Macroinvertebrates	0	1	<u>2</u>	3	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	0	1	<u>2</u>	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Barr Creek</u>		LOCATION <u>Upstream of Confluence w/ Big Creek</u>	
STATION # <u>3</u> RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS <u>ESB, ARS, WGL</u>			
FORM COMPLETED BY <u>ESB</u>		DATE <u>10/13/04</u> TIME <u>09:00</u> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY _____

WEATHER CONDITIONS	Now <input type="checkbox"/> storm (heavy rain) <input checked="" type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover _____ <input type="checkbox"/> clear/sunny			Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input type="checkbox"/>			Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>15</u> °C Other _____																																																																																																																																																	
	SITE LOCATION/MAP Velocity (ft/sec)																																																																																																																																																							
Draw a map of the site and indicate the areas sampled (or attach a photograph)																																																																																																																																																								
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">DFLB (ft)</th> <th style="width: 10%;">Depth (ft)</th> <th style="width: 10%;">Velocity (ft/sec)</th> <th style="width: 10%;">DFLB (ft)</th> <th style="width: 10%;">Depth (ft)</th> <th style="width: 10%;">Velocity (ft/sec)</th> <th style="width: 10%;">DFLB (ft)</th> <th style="width: 10%;">Depth (ft)</th> <th style="width: 10%;">Velocity (ft/sec)</th> </tr> </thead> <tbody> <tr> <td>4"</td> <td>.1</td> <td>—</td> <td>.5</td> <td>.1</td> <td>—</td> <td>.5</td> <td>.1</td> <td>—</td> </tr> <tr> <td>8"</td> <td>.1</td> <td>—</td> <td>1.0</td> <td>.3</td> <td>0.07</td> <td>1.0</td> <td>.2</td> <td>0.04</td> </tr> <tr> <td>12"</td> <td>.2</td> <td>0.12</td> <td>1.5</td> <td>.3</td> <td>0.16</td> <td>1.5</td> <td>.3</td> <td>0.24</td> </tr> <tr> <td>1'4"</td> <td>.2</td> <td>0.19</td> <td>2.0</td> <td>.3</td> <td>0.07</td> <td>2.0</td> <td>.4</td> <td>0.41</td> </tr> <tr> <td>1'8"</td> <td>.2</td> <td>0.07</td> <td>2.5</td> <td>.4</td> <td>0.09</td> <td>2.5</td> <td>.4</td> <td>0.27</td> </tr> <tr> <td>2'</td> <td>.2</td> <td>0.12</td> <td>3.0</td> <td>.4</td> <td>0.04</td> <td>3.0</td> <td>.5</td> <td>0.13</td> </tr> <tr> <td>2'4"</td> <td>.2</td> <td>0.27</td> <td>3.5</td> <td>.5</td> <td>0.13</td> <td>3.5</td> <td>.5</td> <td>0.06</td> </tr> <tr> <td>2'8"</td> <td>.3</td> <td>0.35</td> <td>4.0</td> <td>.5</td> <td>0.11</td> <td>4.0</td> <td>.6</td> <td>0.04</td> </tr> <tr> <td>3'</td> <td>.4</td> <td>0.23</td> <td>4.5</td> <td>.6</td> <td>0.14</td> <td>4.5</td> <td>.5</td> <td>0.03</td> </tr> <tr> <td>3'4"</td> <td>.4</td> <td>0.25</td> <td>5.0</td> <td>.6</td> <td>0.17</td> <td>5.0</td> <td>.2</td> <td>0.01</td> </tr> <tr> <td>3'8"</td> <td>.4</td> <td>0.27</td> <td>5.5</td> <td>.7</td> <td>0.12</td> <td>5.5</td> <td>RB</td> <td></td> </tr> <tr> <td>4'</td> <td>.3</td> <td>0.17</td> <td>6.0</td> <td>.3</td> <td>0.03</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4'4"</td> <td>.3</td> <td>0.16</td> <td>6.5</td> <td>.1</td> <td>—</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4'8"</td> <td>.3</td> <td>0.11</td> <td>7.0</td> <td>RB</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>5'</td> <td>RB</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>									DFLB (ft)	Depth (ft)	Velocity (ft/sec)	DFLB (ft)	Depth (ft)	Velocity (ft/sec)	DFLB (ft)	Depth (ft)	Velocity (ft/sec)	4"	.1	—	.5	.1	—	.5	.1	—	8"	.1	—	1.0	.3	0.07	1.0	.2	0.04	12"	.2	0.12	1.5	.3	0.16	1.5	.3	0.24	1'4"	.2	0.19	2.0	.3	0.07	2.0	.4	0.41	1'8"	.2	0.07	2.5	.4	0.09	2.5	.4	0.27	2'	.2	0.12	3.0	.4	0.04	3.0	.5	0.13	2'4"	.2	0.27	3.5	.5	0.13	3.5	.5	0.06	2'8"	.3	0.35	4.0	.5	0.11	4.0	.6	0.04	3'	.4	0.23	4.5	.6	0.14	4.5	.5	0.03	3'4"	.4	0.25	5.0	.6	0.17	5.0	.2	0.01	3'8"	.4	0.27	5.5	.7	0.12	5.5	RB		4'	.3	0.17	6.0	.3	0.03				4'4"	.3	0.16	6.5	.1	—				4'8"	.3	0.11	7.0	RB					5'	RB							
DFLB (ft)	Depth (ft)	Velocity (ft/sec)	DFLB (ft)	Depth (ft)	Velocity (ft/sec)	DFLB (ft)	Depth (ft)	Velocity (ft/sec)																																																																																																																																																
4"	.1	—	.5	.1	—	.5	.1	—																																																																																																																																																
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5'	RB																																																																																																																																																							
STREAM CHARACTERIZATION <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____																																																																																																																																																								
Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater Catchment Area _____ km ²																																																																																																																																																								

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Heavy	
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Reed Canary Grass</u>			
INSTREAM FEATURES	<table style="width: 100%;"> <tr> <td style="width: 50%;"> Estimated Reach Length <u>100</u> m Estimated Stream Width <u>2</u> m Sampling Reach Area _____ m² Area in km² (m²x1000) _____ km² Estimated Stream Depth <u>0.1</u> m Surface Velocity _____ m/sec (at thalweg) </td><td style="width: 50%;"> Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>5</u> m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>20</u> % <input checked="" type="checkbox"/> Run <u>30</u> % <input checked="" type="checkbox"/> Pool <u>50</u> % Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </td></tr> </table>		Estimated Reach Length <u>100</u> m Estimated Stream Width <u>2</u> m Sampling Reach Area _____ m ² Area in km ² (m ² x1000) _____ km ² Estimated Stream Depth <u>0.1</u> m Surface Velocity _____ m/sec (at thalweg)	Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>5</u> m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>20</u> % <input checked="" type="checkbox"/> Run <u>30</u> % <input checked="" type="checkbox"/> Pool <u>50</u> % Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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LARGE WOODY DEBRIS	LWD <u>0</u> m ³ Density of LWD _____ m ³ /km ² (LWD/ reach area)			
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation _____ %			
WATER QUALITY	<table style="width: 100%;"> <tr> <td style="width: 50%;"> Temperature <u>59.7</u> °F <u>15.4</u> °C Specific Conductance <u>436.2</u> µmhos Dissolved Oxygen <u>13.8</u> mg/L pH <u>7.58</u> Turbidity <u>5.7</u> WQ Instrument Used <u>Troll 9800 LaMotte 2020</u> ORP = <u>+299</u> </td><td style="width: 50%;"> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ </td></tr> </table>		Temperature <u>59.7</u> °F <u>15.4</u> °C Specific Conductance <u>436.2</u> µmhos Dissolved Oxygen <u>13.8</u> mg/L pH <u>7.58</u> Turbidity <u>5.7</u> WQ Instrument Used <u>Troll 9800 LaMotte 2020</u> ORP = <u>+299</u>	Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____
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INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")	5	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	45			
Sand	0.06-2mm (gritty)	35	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	10			2
Clay	< 0.004 mm (slick)	5			

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Barr Creek</u>	LOCATION <u>Upstream of Conf. w/ Big Creek</u>	
STATION # <u>3</u> RIVERMILE _____	STREAM CLASS _____	
LAT _____ LONG _____	RIVER BASIN _____	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>EDB, WGL, ARS</u>		
FORM COMPLETED BY <u>EDB</u>	DATE <u>10/13/04</u> TIME <u>09:30</u> <u>AM</u> PM	REASON FOR SURVEY _____

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.	
SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>1</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>1</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE <u>1</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>1</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>1</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>1</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 42

Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 39

River Code: _____ RM: _____ Stream: Barr Creek
Date: 10/13/04 Location: Station 3 upstream of confluence w/ Big Creek
Scorers Full Name: Ed Belmonte Affiliation: Y3 Approx 285 ft upstream of confluence

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE		POOL RIFFLE		SUBSTRATE ORIGIN		SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR /SLBS [10]	_____	<input checked="" type="checkbox"/> GRAVEL [7]	<u>20</u>	<u>40</u>	Check ONE (OR 2 & AVERAGE)	Check ONE (OR 2 & AVERAGE)			
<input type="checkbox"/> BOULDER [9]	_____	<input checked="" type="checkbox"/> SAND [6]	<u>40</u>	<u>40</u>	<input type="checkbox"/> LIMESTONE [1]	SILT:	<input checked="" type="checkbox"/> SILT HEAVY [-2]		
<input type="checkbox"/> COBBLE [8]	_____	<input type="checkbox"/> BEDROCK [5]	_____	_____	<input checked="" type="checkbox"/> TILLS [1]	<input checked="" type="checkbox"/> SILT MODERATE [-1]			
<input type="checkbox"/> HARDPAN [4]	_____	<input type="checkbox"/> DETRITUS [3]	_____	_____	<input type="checkbox"/> WETLANDS [0]	<input type="checkbox"/> SILT NORMAL [0]			
<input type="checkbox"/> MUCK [2]	_____	<input type="checkbox"/> ARTIFICIAL [0]	_____	_____	<input type="checkbox"/> HARDPAN [0]	<input type="checkbox"/> SILT FREE [1]			
<input type="checkbox"/> SILT [2]	_____	NOTE: Ignore Sludge Originating From Point Sources				<input type="checkbox"/> SANDSTONE [0]	EMBEDDED	<input type="checkbox"/> EXTENSIVE [-2]	
						<input type="checkbox"/> RIP/RAP [0]	NESS:	<input checked="" type="checkbox"/> MODERATE [-1]	
						<input type="checkbox"/> LACUSTRINE [0]		<input type="checkbox"/> NORMAL [0]	
						<input type="checkbox"/> SHALE [-1]		<input type="checkbox"/> NONE [1]	
						<input type="checkbox"/> COAL FINES [-2]			

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]
(High Quality Only, Score 5 or >)

COMMENTS: _____

Substrate
14
Max 20

2] INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)
(Structure) TYPE: Score All That Occur

TYPE		AMOUNT: (Check ONLY One or check 2 and AVERAGE)		Cover
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]	6 Max 20
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input checked="" type="checkbox"/> AQUATIC MACROPHYTES [1]	<input type="checkbox"/> MODERATE 25-75% [7]	
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]	<input type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input checked="" type="checkbox"/> SPARSE 5-25% [3]	
<input type="checkbox"/> ROOTMATS [1]	COMMENTS: _____		<input type="checkbox"/> NEARLY ABSENT < 5% [1]	

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	7 Max 20
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	
<input checked="" type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input checked="" type="checkbox"/> RECOVERING [3]	<input checked="" type="checkbox"/> LOW [1]	<input checked="" type="checkbox"/> CANOPY REMOVAL	
<input type="checkbox"/> NONE [1]	<input checked="" type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS: _____

4] RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION		Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)			2 Max 10
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input type="checkbox"/> NONE/LITTLE [3]			
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input type="checkbox"/> MODERATE [2]			
<input type="checkbox"/> NARROW 5-10 m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input checked="" type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<input checked="" type="checkbox"/> HEAVY/SEVERE [1]			
<input checked="" type="checkbox"/> VERY NARROW < 5 m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]				
<input type="checkbox"/> NONE [0]						

COMMENTS: _____

5.] POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES!]	Pool/Current	
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	3 Max 12	
<input type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]		<input type="checkbox"/> TORRENTIAL [-1]
<input type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]		<input type="checkbox"/> INTERSTITIAL [-1]
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input type="checkbox"/> MODERATE [1]		<input type="checkbox"/> INTERMITTENT [-2]
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]		<input type="checkbox"/> VERY FAST [1]
<input checked="" type="checkbox"/> < 0.2m [POOL=0]	COMMENTS: _____			

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run	
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	1 Max 8	
<input type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]		
<input checked="" type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input checked="" type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input checked="" type="checkbox"/> MODERATE [0]		
				<input type="checkbox"/> EXTENSIVE [-1]	6 Max 10
COMMENTS: _____				<input type="checkbox"/> NO RIFFLE [Metric=0]	

6] GRADIENT (ft/mi): _____ DRAINAGE AREA (sq.mi.): 15.6

%POOL: 50 %GLIDE: _____
%RIFFLE: 20 %RUN: 30

* Best areas must be large enough to support a population of riffle-obligate species

Vial #

Macrobenthos Qualitative Sample List

ORDER	FAMILY	GENUS	SPECIES	COUNT	TOLERANCE VALUES	FBI	
21	Nematomorpha			3		0.000	Parasite
	Hydracarina- Trombidiformes					0.000	Predators/Parasite
23	Tubellaria	Planaria		3	4	0.136	Omnivore
	Porifera	Spongillidae				0.000	Filters
31	Polycyproda	Corbiculidae	Corbicula	fluminea	3.2	0.000	Filters
		Dreissenidae	Dreissena	polymorpha		0.000	Filters
		Unionidae	Villosa	iris		0.000	Filters
18		Sphaeriidae			8	0.000	Filters
	Gastropoda	Ancylidae			6	0.000	Filters
20		Lymnaeidae			6.9	0.000	Scrapers
		Lymnaeidae	Fossaria		6	0.000	Scrapers
19		Physidae		15	8	1.364	Scrapers
		Physidae	Physella		8	0.000	Scrapers
		Planorbidae			7	0.000	Scrapers
		Planorbidae	Planorbula		7	0.000	Scrapers
		Bithyniidae	Bithynia	tentaculata		0.000	Scrapers
1	Annelida	Hirudinea			10	0.000	Scrapers
25		Oligochaeta			8	0.000	Gathers
26	Decapoda				8	0.000	Gathers
17	Amphipoda				8	0.000	Predators
24	Isopoda	Asellidae			8	0.000	Shredders
	Ostracoda				8	0.000	Shredders
	Ephemeroptera	Caenidae			7	0.000	Scavengers
13		Caenidae	Caenis		3.1	0.000	Gathers
		Ephemeridae	Hexagenia		3.6	0.000	Gathers
15		Baetidae	Baetis		7	0.247	Gathers
		Baetidae	Baetis	brunneicolor	4	0.000	Gathers
		Baetidae	Baetis	intercalaris	2.7	0.000	Gathers
		Baetidae	Calibaetis		5.6	0.000	Gathers
14		Haptageniidae	Stenacron		3.1	0.000	Scrapers
		Haptageniidae	Stenacron	gildersleevei	3.1	0.000	Scrapers
		Haptageniidae	Stenonema		4	0.000	Scrapers
		Haptageniidae	Stenonema	exiguum	1.9	0.000	Scrapers
		Isonychidae	Isonychia		2	0.000	Filters
		Leptophlebiidae	Tricorythodes		2.7	0.000	Gathers
		Siphonuridae			7	0.000	Gathers
		Ephemereilidae	Timpanoga		1	0.000	Gathers
8,9	Coleoptera	Leptophlebiidae			2	0.000	Gathers
		Dytiscidae			5	0.000	Predators
37		Gyrinidae		3	5	0.170	Predators
		Gyrinidae	Dineutus	1	3.7	0.042	Predators
27,33		Halpidae			7	0.000	Predators
		Dryopidae			5	0.000	Predators
28,32		Erismidae		4	4	0.182	Gathers
		Paephenidae	Paephenus		4	0.000	Scrapers
		Hydrophilidae				0.000	Gathers
7		Hydrophilidae	Tropisternus	9		0.000	Gathers
	Megaboptera	Salidae			4	0.000	Predators
		Corydalidae	Corydalus		4	0.000	Predators
	Trichoptera	Brachycentridae	Brachycentrus		1	0.000	Filters
		Helicopsychidae	Helicopsyche		3	0.000	Scrapers
		Helicopsychidae	Helicopsyche	borealis	3	0.000	Scrapers
16		Hydropsychidae			4	0.000	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	Hydropsyche	betteni	4	0.000	Filters
		Hydropsychidae	Hydropsyche	scalaris	4	0.000	Filters
		Hydropsychidae	Symphitopsyche		4	0.000	Filters
		Hydroptilidae			4	0.000	Gathers
		Hydroptilidae	Hydroptila		3.2	0.000	Gathers
		Leptoceridae			4	0.000	Shredders
		Leptoceridae	Nectopsyche		4	0.000	Shredders
		Molannidae			6	0.000	Gathers
		Phlebotomidae			3	0.000	Filters
		Phryganeidae	Hagenella		4	0.000	Shredders
		Polycentropodidae	Cymellus		6	0.000	Filters
		Psychomyiidae	Lype		2	0.000	Gathers
36	Hemiptera	Belostomatidae				0.000	Predators
		Belostomatidae	Belostoma			0.000	Predators
34		Cortidae		3	10	0.341	Predators
3		Gerridae			5	0.000	Predators
		Gerridae	Trepobates		5	0.000	Predators
		Notonectidae	Notonecta			0.000	Predators
		Nepidae				0.000	Predators
		Nepidae	Ranatra			0.000	Predators
	Plecoptera	Perlidae	Perlsta			0.000	Predators
		Perlidae	Neoperla		1	0.000	Predators
		Chloroperlidae			1	0.000	Predators
	Odonata-Anisoptera	Aeshnidae			1	0.000	Predators
		Aeshnidae	Boyeria		3	0.000	Predators
		Gomphidae			1	0.000	Predators
		Cordulegastridae			3	0.000	Predators
22		Cordulidae		6	5	0.341	Predators
		Libellulidae			9	0.000	Predators
	Odonata-Zygoptera	Calopterygidae			5	0.000	Predators
4		Calopterygidae	Calopteryx		3.7	0.000	Predators
6		Coenagrionidae		34	6.1	2.357	Predators
5		Coenagrionidae	Argia		5.1	0.000	Predators
30		Coenagrionidae	Engallagma		9	0.000	Predators
		Leptidae			9	0.000	Predators
	Diptera	Ceratopogonidae			5.7	0.000	Gathers
11		Blood-red Chironomidae		1	6.1	0.092	Gathers
12		Other Chironomidae		6	6	0.493	Gathers
35		Culiidae		2	8	0.182	Shredders
10		Simuliidae			6	0.000	Filters
2		Tipulidae		3	3	0.102	Predators
		Stratiomyidae			6	0.000	Gathers
29		Tabanidae				0.000	Predators

TAXA RICHNESS

FBI

Scrafer/Filter

EPT/Chironomidae

% Contribution of Dominant Taxa

EPT Index

Community Similarity Indices

CPOM

Total Number Collected

total shredders

15

5.965

1.000

0.340

1.000

0.600

0.020

100

#DIV/0!

0.000

0.000

0.000

0.000

0.000

0.000

Scrafer = 15 / Filter = 0

Comm. Loss = 0.600

Jaccard Coef. = 0.208

2

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

page of

STREAM NAME <u>Big Creek</u>		LOCATION <u>Water Tank Rd</u>	
STATION # <u>4</u>	RIVERMILE <u> </u>	STREAM CLASS <u> </u>	
LAT <u> </u>	LONG <u> </u>	RIVER BASIN <u> </u>	
STORET # <u> </u>		AGENCY <u> </u>	
COLLECTED BY <u>ESB, WGL</u>		DATE <u>10/13/04</u>	LOT # <u> </u>
TAXONOMIST <u>ESB, WGL</u>		DATE <u> </u>	SUBSAMPLE TARGET <input type="checkbox"/> 100 <input type="checkbox"/> 200 <input type="checkbox"/> 300 <input type="checkbox"/> Other <u> </u>

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR		
Oligochaeta	 (10)	S	A	WGL	1						
Hirudinea					Coleoptera Larva		(3)	H	I	WGL	1
Isopoda					Beetle		(2)	Z	A	WGL	1
Amphipoda					Diptera BW Red	 	(25)	F	WGL	1	(27)
Decapoda					Dr. Chiron	 	(25)	F	WGL	1	(28)
Ephemeroptera					Culicid		(4)	H	I	WGL	1
Canidae		(3)	F	WGL	Gastropoda LH	- Physa	(1)	A	WGL	1	
Plecoptera					RH	- Lymnaea	(1)	A	WGL	1	
Trichoptera					Pelecypoda Asm		(6)	A	WGL	1	
Hemiptera					Other Coenagrionidae	 	(1)	F	WGL	1	(14)
Water Strider	 	(5)	A	WGL	planaria	1	(1)	A	WGL	1	
					horsehair worm	1	(1)	F	WGL	1	
					Odonata	1	(1)	F	WGL	1	

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms

128 (101)

Total No. Taxa

15 (14)

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Big Creek</u>	LOCATION <u>Water Tank Rd</u>	
STATION # <u>4</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>WGL, ARS, EJB</u>	LOT NUMBER	
FORM COMPLETED BY <u>EJB</u>	DATE <u>10/13/04</u> TIME <u>11:00</u> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>10</u> % <input type="checkbox"/> Snags _____ % <input checked="" type="checkbox"/> Vegetated Banks <u>5</u> % <input checked="" type="checkbox"/> Sand <u>30</u> % <input checked="" type="checkbox"/> Submerged Macrophytes <u>5</u> % <input type="checkbox"/> Other (_____) _____ %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>10</u> <input type="checkbox"/> Snags _____ <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> <input checked="" type="checkbox"/> Sand <u>10</u> <input checked="" type="checkbox"/> Submerged Macrophytes <u>10</u> <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	<u>2</u>	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	0	1	2	<u>3</u>	4	Macroinvertebrates	0	1	<u>2</u>	3	4
Macrophytes	0	<u>1</u>	2	3	4	Fish	0	<u>1</u>	<u>2</u>	3	4

Longear Sunfish

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Big Creek</u>		LOCATION <u>Water Tank Rd</u>	
STATION # <u>4</u> RIVERMILE		STREAM CLASS	
LAT _____ LONG _____		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS <u>EDB, WGL</u>			
FORM COMPLETED BY <u>EDB</u>		DATE <u>10/13/04</u> TIME <u>11:00</u> <u>AM</u> PM	REASON FOR SURVEY

WEATHER CONDITIONS			Now <input type="checkbox"/> storm (heavy rain) <input checked="" type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny			Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %			Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>15</u> °C Other _____		
SITE LOCATION/MAP			Draw a map of the site and indicate the areas sampled (or attach a photograph)								
(A) DFLB	(A) Depth	Velocity (ft/sec)	(A) DFLB	(A) Depth	Velocity	(A) DFLB	(A) Depth	Velocity (ft/sec)			
1.0	0.8	0.07	0.5	1.0	0.07	1.0	1.6	0.09			
2.0	1.3	0.07	1.0	1.7	0.10	2.0	1.9	0.12			
3.0	1.4	0.08	1.5	2.0	0.10	3.0	1.9	0.08			
4.0	1.4	0.13	2.0	1.9	0.10						
5.0	1.3	0.12	2.5	1.8	0.10	4.0	2.0	0.05			
6.0	1.6	0.06	3.0	1.8	0.10	5.0	2.0	0.07			
7.0	1.6	0.08	3.5	1.9	0.09	6.0	1.9	0.11			
8.0	1.6	0.10	4.0	1.9	0.08	7.0	1.9	0.15			
9.0	1.6	0.06	4.5	2.0	0.09	8.0	1.9	0.09			
10.0	1.5	0.13	5.0	2.0	0.08	9.0	1.2	0.03			
11.0	0.8	0.10	5.5	1.9	0.14	10.0	0.2	0.03			
12.0	0.5	0.10	6.0	1.9	0.12	10.5	RB				
13.0	0.3	—	6.5	2.0	0.09						
14.0	RB		7.0	2.0	0.08						
			7.5	2.0	0.08						
			8.0	2.0	0.05						
			8.5	1.8	0.06						
			9.0	1.5	0.05						
			9.5	1.2	0.06						
			10.0	0.8	0.05						
			10.5	0.4	0.05						
			11.0	RB							
STREAM CHARACTERIZATION			Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____			Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater Catchment Area _____ km²					

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Red Canary Grass</u>	
INSTREAM FEATURES	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Estimated Reach Length <u>100</u> m Estimated Stream Width <u>5</u> m Sampling Reach Area _____ m² Area in km² (m²x1000) _____ km² Estimated Stream Depth <u>.5</u> m Surface Velocity _____ m/sec (at thalweg) </div> <div style="width: 50%;"> Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>4</u> m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>3</u> % <input checked="" type="checkbox"/> Run <u>8</u> % <input checked="" type="checkbox"/> Pool <u>90</u> % Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </div> </div>	
LARGE WOODY DEBRIS	LWD <u>0</u> m ² Density of LWD _____ m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input checked="" type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present <u>Filamentous Algae</u> Portion of the reach with aquatic vegetation _____ %	
WATER QUALITY	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Temperature <u>61</u> °F <u>16.1</u> °C Specific Conductance <u>409</u> µmhos Dissolved Oxygen <u>8.78</u> mg/L pH <u>7.43</u> Turbidity <u>20</u> WQ Instrument Used <u>Troll 9000 LaMotte</u> <u>ORP = +306</u> </div> <div style="width: 50%;"> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input checked="" type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input checked="" type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ </div> </div>	
SEDIMENT/SUBSTRATE	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse </div> <div style="width: 50%;"> Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </div> </div>	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	2
Boulder	> 256 mm (10")	5			
Cobble	64-256 mm (2.5"-10")	10			
Gravel	2-64 mm (0.1"-2.5")	25	Muck-Mud	black, very fine organic (FPOM)	
Sand	0.06-2mm (gritty)	30			
Silt	0.004-0.06 mm	20			
Clay	< 0.004 mm (slick)	10	Marl	grey, shell fragments	2

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Big Creek</u>	LOCATION <u>Water Tank Rd</u>	
STATION # <u>4</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>EJB, WGL, ARS</u>		
FORM COMPLETED BY <u>EJB</u>	DATE <u>10/13/04</u> TIME <u>11:00</u> <u>AM</u> PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE <u>13</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE <u>14</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.	
SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 <u>3</u> 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>1</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>1</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE <u>4</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>4</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>1</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>1</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 77



Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

42

River Code: RM: Stream: Big Creek
Date: 10/13/04 Location: Water Tank Rd, Station 4
Scorers Full Name: Ed Belmonte Affiliation: _____

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE	POOL RIFFLE	SUBSTRATE ORIGIN		SUBSTRATE QUALITY	
				Check ONE (OR 2 & AVERAGE)		Check ONE (OR 2 & AVERAGE)	
<input type="checkbox"/> BLDR/SLBS [10]	_____	<input type="checkbox"/> GRAVEL [7]	_____	<input type="checkbox"/> SILT:	_____	<input type="checkbox"/> SILT HEAVY [-2]	Substrate <div style="border: 1px solid black; padding: 5px; display: inline-block;">9</div> Max 20
<input type="checkbox"/> BOULDER [9]	_____	<input checked="" type="checkbox"/> SAND [6]	<u>20</u> <u>20</u>	<input checked="" type="checkbox"/> LIMESTONE [1]	_____	<input checked="" type="checkbox"/> SILT MODERATE [-1]	
<input type="checkbox"/> COBBLE [8]	_____	<input type="checkbox"/> BEDROCK [5]	_____	<input checked="" type="checkbox"/> TILLS [1]	_____	<input type="checkbox"/> SILT NORMAL [0]	
<input type="checkbox"/> HARDPAN [4]	_____	<input type="checkbox"/> DETRITUS [3]	_____	<input type="checkbox"/> WETLANDS [0]	_____	<input type="checkbox"/> SILT FREE [1]	
<input type="checkbox"/> MUCK [2]	_____	<input type="checkbox"/> ARTIFICIAL [0]	_____	<input type="checkbox"/> HARDPAN [0]	_____	<input type="checkbox"/> EXTENSIVE [-2]	
<input checked="" type="checkbox"/> SILT [2]	<u>50</u> <u>10</u>	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SANDSTONE [0]	EMBEDDED	<input checked="" type="checkbox"/> MODERATE [-1]	
				<input type="checkbox"/> RIP/RAP [0]	NESS:	<input type="checkbox"/> NORMAL [0]	
				<input type="checkbox"/> LACUSTRINE [0]		<input type="checkbox"/> NONE [1]	
				<input type="checkbox"/> SHALE [-1]			
				<input type="checkbox"/> COAL FINES [-2]			

NUMBER OF SUBSTRATE TYPES:
(High Quality Only, Score 5 or >)☒ 4 or More [2]
☐ 3 or Less [0]

COMMENTS: _____

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)		Cover
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> OXBOWS, BACKWATERS [1]	<input type="checkbox"/> EXTENSIVE > 75% [11]	<div style="border: 1px solid black; padding: 5px; display: inline-block;">9</div> Max 20
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input checked="" type="checkbox"/> AQUATIC MACROPHYTES [1]	<input type="checkbox"/> MODERATE 25-75% [7]	
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> BOULDERS [1]	<input type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input checked="" type="checkbox"/> SPARSE 5-25% [3]	
<input type="checkbox"/> ROOTMATS [1]	COMMENTS: _____		<input type="checkbox"/> NEARLY ABSENT < 5% [1]	

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING	<div style="border: 1px solid black; padding: 5px; display: inline-block;">7</div> Max 20
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION	
<input checked="" type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input checked="" type="checkbox"/> RECOVERING [3]	<input checked="" type="checkbox"/> LOW [1]	<input checked="" type="checkbox"/> CANOPY REMOVAL	
<input type="checkbox"/> NONE [1]	<input checked="" type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING	
				<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS: _____

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION		Riparian
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)			<div style="border: 1px solid black; padding: 5px; display: inline-block;">3</div> Max 10
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input type="checkbox"/> NONE/LITTLE [3]	<input type="checkbox"/> NONE/LITTLE [3]		
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input checked="" type="checkbox"/> MODERATE [2]	<input checked="" type="checkbox"/> MODERATE [2]		
<input type="checkbox"/> NARROW 5-10 m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input checked="" type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<input type="checkbox"/> HEAVY/SEVERE [1]	<input type="checkbox"/> HEAVY/SEVERE [1]		
<input checked="" type="checkbox"/> VERY NARROW < 5 m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]				
<input type="checkbox"/> NONE [0]						

COMMENTS: _____

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY (POOLS & RIFFLES!)	Pool/Current
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	
<input type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1]	<div style="border: 1px solid black; padding: 5px; display: inline-block;">7</div> Max 12
<input checked="" type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1]	
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input type="checkbox"/> MODERATE [1]	
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1]	
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS: _____	<input type="checkbox"/> TORRENTIAL [-1]	
		<input type="checkbox"/> INTERSTITIAL [-1]	
		<input type="checkbox"/> INTERMITTENT [-2]	
		<input type="checkbox"/> VERY FAST [1]	

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	<div style="border: 1px solid black; padding: 5px; display: inline-block;">1</div> = 36 Max 8
<input type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]	
<input checked="" type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input checked="" type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input checked="" type="checkbox"/> MODERATE [0]	
COMMENTS: _____		<input type="checkbox"/> NO RIFFLE [Metric=0]	<input type="checkbox"/> EXTENSIVE [-1]	<div style="border: 1px solid black; padding: 5px; display: inline-block;">6</div> Max 10

6) GRADIENT (ft/mi): _____ DRAINAGE AREA (sq.mi.): 62.3%POOL: 88
%RIFFLE: 2%GLIDE: _____
%RUN: 10

* Best areas must be large enough to support a population of riffle-obligate species

Macrobenthos Qualitative Sample List

Vial #

ORDER	FAMILY	GENUS	SPECIES	COUNT	TOLERANCE VALUES	FBI	
21	Nematomorpha					0.000	Parasite
	Hydracarina- Trombidiformes					0.000	Predators/Parasite
23	Tubellaria	Planaria		1	4	0.044	Omnivore
	Porifera	Spongiidae				0.000	Filters
31	Polycyopoda	Corbiculidae	Corbicula	6	3.2	0.213	Filters
		Dreissenidae	Dreissena			0.000	Filters
		Unionidae	Villosa			0.000	Filters
18		Sphaeriidae				0.000	Filters
	Gastropoda	Ancylidae				0.000	Scrapers
20		Lymnaeidae		1	6.9	0.077	Scrapers
		Lymnaeidae	Fossaria			0.000	Scrapers
19		Physidae		1	8	0.089	Scrapers
		Physidae	Physella			0.000	Scrapers
		Planorbidae				0.000	Scrapers
		Planorbidae	Planorbula			0.000	Scrapers
		Pleuroceridae				0.000	Scrapers
		Bithyniidae	Bithynia			0.000	Scrapers
1	Annelida	Hirudinea				0.000	Gathers
25		Oligochaeta		10		0.000	Gathers
26	Decapoda					0.000	Predators
17	Amphipoda					0.000	Shredders
24	Isopoda	Asellidae				0.000	Shredders
	Ostracoda					0.000	Scavengers
	Ephemeroptera	Caenidae				0.000	Gathers
13		Caenidae	Caenis	3	3.1	0.103	Gathers
		Ephemeridae	Hexagenia			0.000	Gathers
15		Baetidae	Baetis			0.000	Gathers
		Baetidae	Baetis			0.000	Gathers
		Baetidae	Baetis			0.000	Gathers
		Baetidae	Baetis			0.000	Gathers
		Baetidae	Baetis			0.000	Gathers
14		Haplagenidae	Stenonema			0.000	Scrapers
		Haplagenidae	Stenonema			0.000	Scrapers
		Haplagenidae	Stenonema			0.000	Scrapers
		Haplagenidae	Stenonema			0.000	Scrapers
		Haplagenidae	Stenonema			0.000	Scrapers
		Isomyiidae	Isomyia			0.000	Filters
		Leptophlebiidae	Tricorythodes			0.000	Gathers
		Siphonuridae				0.000	Gathers
		Ephemerellidae	Timpanoga			0.000	Gathers
		Leptophlebiidae				0.000	Gathers
8,9	Coeloptera	Dytiscidae		2	5	0.111	Predators
37		Gyrinidae				0.000	Predators
		Gyrinidae	Dineutus			0.000	Predators
27,33		Halpidae		3	7	0.233	Predators
		Dryopidae				0.000	Predators
28,32		Elmidae				0.000	Gathers
		Psaphanidae	Psaphenus			0.000	Scrapers
		Hydrophilidae				0.000	Gathers
7		Hydrophilidae	Tropisternus			0.000	Gathers
	Megaloptera	Salidae				0.000	Predators
		Corydalidae	Corydalus			0.000	Predators
	Trichoptera	Brachycentridae	Brachycentrus			0.000	Filters
		Helicopsychidae	Helicopsyche			0.000	Scrapers
		Helicopsychidae	Helicopsyche			0.000	Scrapers
16		Hydropsychidae				0.000	Filters
		Hydropsychidae	Hydropsyche			0.000	Filters
		Hydropsychidae	Hydropsyche			0.000	Filters
		Hydropsychidae	Hydropsyche			0.000	Filters
		Hydropsychidae	Symphitopsyche			0.000	Filters
		Hydroptilidae				0.000	Gathers
		Hydroptilidae	Hydroptila			0.000	Gathers
		Leptoceridae				0.000	Shredders
		Leptoceridae	Nectopsyche			0.000	Shredders
		Molannidae				0.000	Gathers
		Phlebotomidae				0.000	Filters
		Phryganidae	Hagenella			0.000	Shredders
		Polycentropodidae	Cymellus			0.000	Filters
		Psychomyiidae	Lype			0.000	Gathers
36	Hemiptera	Belostomatidae	Belostoma			0.000	Predators
		Belostomatidae	Belostoma			0.000	Predators
34		Corixidae				0.000	Predators
3		Gerridae		5	5	0.278	Predators
		Gerridae	Trepobates			0.000	Predators
		Notonectidae	Notonecta			0.000	Predators
		Nepidae				0.000	Predators
		Nepidae	Ranatra			0.000	Predators
	Plecoptera	Perlidae	Perla			0.000	Predators
		Perlidae	Neoperla			0.000	Predators
		Chloroperlidae				0.000	Predators
	Odonata-Anisoptera	Aeshnidae				0.000	Predators
		Aeshnidae	Boyeria			0.000	Predators
		Gomphidae				0.000	Predators
		Condulegastriidae				0.000	Predators
22		Condulegastriidae		1	5	0.056	Predators
		Libellulidae				0.000	Predators
	Odonata-Zygoptera	Calopterygidae				0.000	Predators
4		Calopterygidae	Calopteryx			0.000	Predators
6		Coenagrionidae				0.000	Predators
5		Coenagrionidae	Argia	14	5.1	0.793	Predators
30		Coenagrionidae	Engallagma			0.000	Predators
		Lestidae				0.000	Predators
		Ceratopogonidae				0.000	Gathers
11		Blood-red Chironomidae		27	8.1	2.430	Gathers
12		Other Chironomidae		22	6	1.487	Gathers
35		Culiidae		4	8	0.356	Shredders
2		Simuliidae				0.000	Filters
10		Ticulidae				0.000	Predators
		Stratiomyidae				0.000	Gathers
25		Tabanidae				0.000	Predators

TAXA RICHNESS

FBI 6.250
 Scraper/Filter 0.333
 EPT/Chironomidae 0.061
 % Contribution of Dominant Taxa 0.270
 EPT Index 1.000
 Community Similarity Indices 0.714

Comm. Loss = 0.714
 Jaccard Coef. = 0.167

CPOM

Total Number Collected 100

total shredders

4

page ____ of ____

Enter Family and/or Genus and Species name on blank line.

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I= immature; P= pupa; A= adult TI= Taxonomists initials

~~12~~ 6 100

20 (19)

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Big Creek</u>	LOCATION <u>Emge RI</u>	
STATION # <u>5</u> RIVERMILE	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS <u>ESB, WGL</u>	LOT NUMBER	
FORM COMPLETED BY <u>ESB</u>	DATE <u>10/12/04</u> TIME <u>14:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>20</u> % <input checked="" type="checkbox"/> Snags <u>2</u> % <input checked="" type="checkbox"/> Vegetated Banks <u>5</u> % <input checked="" type="checkbox"/> Sand <u>5</u> % <input checked="" type="checkbox"/> Submerged Macrophytes <u>2</u> % <input type="checkbox"/> Other () _____ %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>20</u> <input checked="" type="checkbox"/> Snags <u>10</u> <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> <input checked="" type="checkbox"/> Sand <u>10</u> <input checked="" type="checkbox"/> Submerged Macrophytes <u>10</u> <input type="checkbox"/> Other () _____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	<u>2</u>	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	0	1	<u>2</u>	3	4	Macroinvertebrates	0	<u>1</u>	2	3	4
Macrophytes	0	<u>1</u>	2	3	4	Fish	0	1	<u>2</u>	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME <u>Bla Creek</u>		LOCATION <u>Emge Rd</u>
STATION # <u>5</u> RIVERMILE		STREAM CLASS
LAT _____	LONG _____	RIVER BASIN
STORET #		AGENCY
INVESTIGATORS <u>ESB, WGL, AS</u> and <u>10/13/04</u> at <u>08:00</u>		
FORM COMPLETED BY <u>ESB, WGL</u>		DATE <u>10/12/04</u> TIME <u>15:00</u> AM <input checked="" type="checkbox"/> PM
REASON FOR SURVEY		

WEATHER CONDITIONS	Now	Past 24 hours	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 100% <input type="checkbox"/>	Air Temperature <u>17</u> °C Other _____

(FT) DFLB			DEPTH FT			VELOCITY FT/SEC		
SITE LOCATION/MAP			Draw a map of the site and indicate the areas sampled (or attach a photograph)			VELOCITY		
DEPTH FT	VELOCITY FT/SEC	DFLB (FT)	DEPTH FT	VELOCITY FT/SEC	DFLB (FT)	DEPTH (FT)	VELOCITY (FT/SEC)	
2	0.05	2	1.3	0.07	2.0	1.2	0.03	
4	0.01	4	2.6	0.06	4	1.5	0.03	
6	0.05	6	3.1	0.01	6	2.0	0.08	
8	0.08	8	3.3	0.05	8	3.2	0.07	
10	0.09	10	3.3	0.09	10	3.2	0.08	
12	0.14	12	3.1	0.10	12	3.0	0.08	
14	0.06	14	3.0	0.06	14	3.0	0.09	
16	0.02	16	2.7	0.13	16	2.8	0.10	
18	0.10	18	2.4	0.06	18	2.4	0.10	
20	0.02	20	2.0	0.05	20	1.6	0.04	
22	0.03	22	0.9	0.02	22	- BANK		
24	- BANK		23	- BANK				

STREAM CHARACTERIZATION	Stream Subsystem <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater
	Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Swamp and bog	Catchment Area _____ km ² <input type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Other _____

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input checked="" type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>Red Canary Grass</u>		
INSTREAM FEATURES	Estimated Reach Length <u>100</u> m Canopy Cover Estimated Stream Width <u>7</u> m <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Sampling Reach Area _____ m ² High Water Mark <u>7</u> m Area in km² (m²x1000) _____ km ² Proportion of Reach Represented by Stream Morphology Types Estimated Stream Depth <u>.5</u> m <input type="checkbox"/> Riffle <u>2</u> % <input type="checkbox"/> Run <u>5</u> % Surface Velocity _____ m/sec <input type="checkbox"/> Pool _____ % Channelized <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD <u>1</u> m ³ Density of LWD _____ m ³ /km ² (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input checked="" type="checkbox"/> Attached Algae dominant species present <u>Filamentous Algae</u> Portion of the reach with aquatic vegetation <u>5</u> %		
WATER QUALITY	Temperature <u>60.8 °F</u> <u>16.0 °C</u> Water Odors Specific Conductance <u>404.1</u> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Dissolved Oxygen <u>11.7</u> Water Surface Oils pH <u>7.5</u> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity <u>30</u> Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input checked="" type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ WQ Instrument Used <u>Troll 9000</u> <u>ORP = +281</u>		
SEDIMENT/SUBSTRATE	Odors <input type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input checked="" type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	10	Muck-Mud	black, very fine organic (FPOM)	
Cobble	64-256 mm (2.5"-10")	25			
Gravel	2-64 mm (0.1"-2.5")	25			
Sand	0.06-2mm (gritty)	5	Marl	grey, shell fragments	2
Silt	0.004-0.06 mm	30			
Clay	< 0.004 mm (slick)	5			

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME <u>Big Creek</u>	LOCATION <u>Emge Rd</u>
STATION # <u>5</u> RIVERMILE	STREAM CLASS
LAT _____ LONG _____	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS <u>ESB, WGL</u>	
FORM COMPLETED BY <u>ESB</u>	DATE <u>10/12/04</u> TIME <u>14:00</u> AM <input checked="" type="radio"/> PM
REASON FOR SURVEY	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE 3	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>10</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7. Channel Sinuosity The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.	
SCORE <u>5</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>1</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>1</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE <u>4</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>4</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>1</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>1</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 77



Qualitative Habitat Evaluation Index Field Sheet QHEI Score:

45

River Code: RM: Stream: Big Creek
Date: 10/12/04 Location: Station 5 Emage Rd
Scorers Full Name: Ed Belmonte Affiliation: V3

1) SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Estimate % present)

TYPE		POOL RIFFLE		POOL RIFFLE		SUBSTRATE ORIGIN		SUBSTRATE QUALITY	
<input type="checkbox"/> BLDR /SLBS [10]		<input type="checkbox"/> GRAVEL [7]		Check ONE (OR 2 & AVERAGE)		Check ONE (OR 2 & AVERAGE)			
<input type="checkbox"/> BOULDER [9]		<input type="checkbox"/> SAND [6]		<input type="checkbox"/> LIMESTONE [1]	SILT:	<input checked="" type="checkbox"/> SILT HEAVY [-2]		Substrate	
<input checked="" type="checkbox"/> COBBLE [8]	0 40	<input type="checkbox"/> BEDROCK [5]		<input checked="" type="checkbox"/> TILLS [1]		<input type="checkbox"/> SILT MODERATE [-1]		9	
<input type="checkbox"/> HARDPAN [4]		<input type="checkbox"/> DETRITUS [3]		<input type="checkbox"/> WETLANDS [0]		<input type="checkbox"/> SILT NORMAL [0]		Max 20	
<input type="checkbox"/> MUCK [2]		<input type="checkbox"/> ARTIFICIAL [0]		<input type="checkbox"/> HARDPAN [0]		<input checked="" type="checkbox"/> SILT FREE [1]			
<input checked="" type="checkbox"/> SILT [2]	80 10	NOTE: Ignore Sludge Originating From Point Sources		<input type="checkbox"/> SANDSTONE [0]	EMBEDDED	<input checked="" type="checkbox"/> EXTENSIVE [-2]			
				<input type="checkbox"/> RIP/RAP [0]	NESS:	<input type="checkbox"/> MODERATE [-1]			
				<input type="checkbox"/> LACUSTRINE [0]		<input type="checkbox"/> NORMAL [0]			
				<input type="checkbox"/> SHALE [-1]		<input type="checkbox"/> NONE [1]			
				<input type="checkbox"/> COAL FINES [-2]					

NUMBER OF SUBSTRATE TYPES: ☒ 4 or More [2] ☐ 3 or Less [0]

COMMENTS:

2) INSTREAM COVER (Give each cover type a score of 0 to 3; see back for instructions)

TYPE: Score All That Occur		AMOUNT: (Check ONLY One or check 2 and AVERAGE)	
<input type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> POOLS > 70 cm [2]	<input type="checkbox"/> EXTENSIVE > 75% [11]	Cover 10 Max 20
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> ROOTWADS [1]	<input type="checkbox"/> MODERATE 25-75% [7]	
<input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> BOULDERS [1]	<input checked="" type="checkbox"/> SPARSE 5-25% [3]	
<input type="checkbox"/> ROOTMATS [1]	COMMENTS:	<input type="checkbox"/> NEARLY ABSENT < 5% [1]	

3) CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	MODIFICATIONS/OTHER	Channel 7 Max 20	
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [7]	<input type="checkbox"/> NONE [6]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> SNAGGING <input type="checkbox"/> IMPOUND.		
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [5]	<input type="checkbox"/> RECOVERED [4]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> RELOCATION <input type="checkbox"/> ISLANDS		
<input checked="" type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [3]	<input checked="" type="checkbox"/> RECOVERING [3]	<input checked="" type="checkbox"/> LOW [1]	<input checked="" type="checkbox"/> CANOPY REMOVAL <input type="checkbox"/> LEVEED		
<input type="checkbox"/> NONE [1]	<input checked="" type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		<input type="checkbox"/> DREDGING <input type="checkbox"/> BANK SHAPING		
					<input type="checkbox"/> ONE SIDE CHANNEL MODIFICATIONS	

COMMENTS:

4) RIPARIAN ZONE AND BANK EROSION (check ONE box per bank or check 2 and AVERAGE per bank) River Right Looking Downstream f

RIPARIAN WIDTH		FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)		BANK EROSION		Riparian 2 Max 10
L R (Per Bank)	L R (Most Predominant Per Bank)	L R	L R (Per Bank)			
<input type="checkbox"/> WIDE > 50m [4]	<input type="checkbox"/> FOREST, SWAMP [3]	<input type="checkbox"/> CONSERVATION TILLAGE [1]	<input type="checkbox"/> NONE/LITTLE [3]			
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> SHRUB OR OLD FIELD [2]	<input type="checkbox"/> URBAN OR INDUSTRIAL [0]	<input type="checkbox"/> MODERATE [2]			
<input type="checkbox"/> NARROW 5-10 m [2]	<input type="checkbox"/> RESIDENTIAL, PARK, NEW FIELD [1]	<input checked="" type="checkbox"/> OPEN PASTURE, ROWCROP [0]	<input checked="" type="checkbox"/> HEAVY/SEVERE [1]			
<input checked="" type="checkbox"/> VERY NARROW < 5 m [1]	<input type="checkbox"/> FENCED PASTURE [1]	<input type="checkbox"/> MINING/CONSTRUCTION [0]				
<input type="checkbox"/> NONE [0]						

COMMENTS:

5) POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH	MORPHOLOGY	CURRENT VELOCITY [POOLS & RIFFLES!]	Pool/ Current 9 Max 12
(Check 1 ONLY!)	(Check 1 or 2 & AVERAGE)	(Check All That Apply)	
<input checked="" type="checkbox"/> > 1m [6]	<input checked="" type="checkbox"/> POOL WIDTH > RIFFLE WIDTH [2]	<input type="checkbox"/> EDDIES [1] <input type="checkbox"/> TORRENTIAL [-1]	
<input type="checkbox"/> 0.7-1m [4]	<input type="checkbox"/> POOL WIDTH = RIFFLE WIDTH [1]	<input type="checkbox"/> FAST [1] <input type="checkbox"/> INTERSTITIAL [-1]	
<input type="checkbox"/> 0.4-0.7m [2]	<input type="checkbox"/> POOL WIDTH < RIFFLE W. [0]	<input type="checkbox"/> MODERATE [1] <input type="checkbox"/> INTERMITTENT [-2]	
<input type="checkbox"/> 0.2-0.4m [1]		<input checked="" type="checkbox"/> SLOW [1] <input type="checkbox"/> VERY FAST [1]	
<input type="checkbox"/> < 0.2m [POOL=0]	COMMENTS:		

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH	RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	Riffle/Run 2 = 39 Max 8 Gradient 6 Max 10
<input type="checkbox"/> Best Areas > 10 cm [2]	<input type="checkbox"/> MAX > 50 [2]	<input checked="" type="checkbox"/> STABLE (e.g., Cobble, Boulder) [2]	<input type="checkbox"/> NONE [2]	
<input type="checkbox"/> Best Areas 5-10 cm [1]	<input checked="" type="checkbox"/> MAX < 50 [1]	<input type="checkbox"/> MOD. STABLE (e.g., Large Gravel) [1]	<input type="checkbox"/> LOW [1]	
<input checked="" type="checkbox"/> Best Areas < 5 cm [RIFFLE=0]		<input type="checkbox"/> UNSTABLE (Fine Gravel, Sand) [0]	<input type="checkbox"/> MODERATE [0]	
			<input checked="" type="checkbox"/> EXTENSIVE [-1]	
		<input type="checkbox"/> NO RIFFLE [Metric=0]		

COMMENTS:

6) GRADIENT (ft/mi): DRAINAGE AREA (sq.mi.): 78.1

%POOL: 93

%GLIDE:

%RIFFLE: 2

%RUN: 5

* Best areas must be large enough to support a population of riffle-obligate species

Macrobenthos Qualitative Sample List

Vial #

ORDER	FAMILY	GENUS	SPECIES	COUNT	TOLERANCE VALUES	FBI	
21	Nematomorpha					0.000	Parasite
	Hydracarina- Trembidiformes					0.000	Predators/Parasite
29	Tubellaria	Planaria		2	4	0.084	Omnivore
	Foriers	Spongiidae				0.000	Filters
31	Pelecypoda	Corbiculidae	Corbicula fluminea	2	3.2	0.067	Filters
		Dreissenidae	Dreissena polymorpha			0.000	Filters
		Unionidae	Villosa iris			0.000	Filters
18		Sphaeriidae			8	0.000	Filters
	Gastropoda	Ancylidae			6	0.000	Scrapers
20		Lymnaeidae		6	6.9	0.436	Scrapers
		Lymnaeidae	Fossaria		6	0.000	Scrapers
19		Physidae	Physella	3	8	0.233	Scrapers
		Planorbidae			8	0.000	Scrapers
		Planorbidae	Planorbula		7	0.000	Scrapers
		Pleurocaridae			7	0.000	Scrapers
		Bithyniidae	Bithynia tentaculata			0.000	Scrapers
1	Annelida	Hirudinea		1	10	0.105	Gathers
25		Oligochaeta		4		0.000	Gathers
26	Decapoda				8	0.000	Predators
17	Amphipoda				4	0.000	Shredders
24	Isopoda	Aesliidae			8	0.000	Shredders
	Ostracoda				8	0.000	Scavengers
	Ephemeroptera	Caenidae			7	0.000	Gathers
13		Caenidae	Caenis	5	3.1	0.183	Gathers
		Ephemeridae	Hexagenia		3.6	0.000	Gathers
15		Baetidae	Baetis		3.1	0.000	Gathers
		Baetidae	Baetis brunneicolor		4	0.000	Gathers
		Baetidae	Baetis intercalaris		2.7	0.000	Gathers
		Baetidae	Calibaetis		5.6	0.000	Gathers
14		Heptageniidae	Stenacron		3.1	0.000	Scrapers
		Heptageniidae	Stenacron glikersleevei		3.1	0.000	Scrapers
		Heptageniidae	Stenonema		4	0.000	Scrapers
		Heptageniidae	Stenonema exiguum		1.9	0.000	Scrapers
		Isotrichidae	Isotricha		2	0.000	Filters
		Leptophlebiidae	Tricorythodes		2.7	0.000	Gathers
		Siphonuridae			7	0.000	Gathers
		Ephemerellidae	Timpanoga		1	0.000	Gathers
		Leptophlebiidae			2	0.000	Gathers
8,9	Coleoptera	Dytiscidae		4	5	0.211	Predators
37		Gyrinidae		2	5	0.105	Predators
		Gyrinidae	Dineutus		3.7	0.000	Predators
27,33		Halpidae		2	7	0.147	Predators
		Dryopidae			5	0.000	Predators
28,32		Elmidae		9	4	0.378	Gathers
		Psaphenidae	Psaphenus		4	0.000	Scrapers
		Hydrophilidae				0.000	Gathers
7		Hydrophilidae	Tropisternus			0.000	Gathers
	Megaloptera	Salidae			4	0.000	Predators
		Corydalidae	Corydalus		4	0.000	Predators
	Trichoptera	Brachycentridae	Brachycentrus		1	0.000	Filters
		Helicopsychidae	Helicopsyche		3	0.000	Scrapers
		Helicopsychidae	Helicopsyche borealis		3	0.000	Scrapers
16		Hydropsychidae			4	0.000	Filters
		Hydropsychidae	Hydropsyche		4	0.000	Filters
		Hydropsychidae	Hydropsyche betteni		4	0.000	Filters
		Hydropsychidae	Hydropsyche scalaris		4	0.000	Filters
		Hydropsychidae	Symphlepsyche		4	0.000	Filters
		Hydroptilidae			4	0.000	Gathers
		Hydroptilidae	Hydroptila		3.2	0.000	Gathers
		Leptoceridae			4	0.000	Shredders
		Leptoceridae	Nectopsyche		4	0.000	Shredders
		Molannidae			6	0.000	Gathers
		Philopotamidae			3	0.000	Filters
		Phryganeidae	Hagenella		4	0.000	Shredders
		Polycentropodidae	Cymellus		6	0.000	Filters
		Psychomyiidae	Lype		2	0.000	Gathers
36	Hemiptera	Belostomatidae		1		0.000	Predators
		Belostomatidae	Belostoma			0.000	Predators
34		Corixidae		3	10	0.316	Predators
3		Gerridae		2	5	0.105	Predators
		Gerridae	Trepobates		5	0.000	Predators
		Notonectidae	Notonecta			0.000	Predators
		Nepidae				0.000	Predators
		Nepidae	Ranatra			0.000	Predators
	Plecoptera	Perlidae	Perlesta		1	0.000	Predators
		Perlidae	Neoperla		1	0.000	Predators
		Chloroperlidae			1	0.000	Predators
	Odonata-Anisoptera	Aeshnidae			3	0.000	Predators
		Aeshnidae	Boyeria		3	0.000	Predators
		Gomphidae			1	0.000	Predators
		Cordulegastridae			3	0.000	Predators
22		Cordulidae			5	0.000	Predators
		Libellulidae			9	0.000	Predators
	Odonata-Zygoptera	Calopterygidae			5	0.000	Predators
4		Calopterygidae	Calopteryx		3	0.000	Predators
6		Coenagrionidae		12	6.1	0.899	Predators
5		Coenagrionidae	Argia	2	5.1	0.107	Predators
30		Coenagrionidae	Engallagma	10	9	0.947	Predators
		Leptidae			9	0.000	Predators
	Diptera	Ceratopogonidae			5.7	0.000	Gathers
11		Blood-red Chironomidae		13	8.1	1.108	Gathers
12		Other Chironomidae		15	6	0.947	Gathers
35		Culicidae			8	0.000	Shredders
10		Simuliidae			6	0.000	Filters
2		Tipulidae			3	0.000	Predators
		Stratiomyidae			1	0.000	Gathers
21		Tabanidae			1	0.000	Predators

TAXA RICHNESS

19

FBI

0.381

Scrapper/Filter

4.500

EPT/Chironomidae

0.179

% Contribution of Dominant Taxa

0.150

EPT Index

1.000

Community Similarity Indices

0.474

Comm. Loss = 0.474

Jaccard Coef. = 0.179

CPOM

0.000

Total Number Collected

100

total shredders

0

APPENDIX II:

MACROINVERTEBRATE VOUCHER SPECIMENS

PURDUE

Department of Entomology

8 Mar 2005

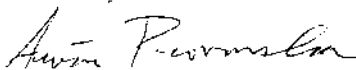
Walter Levernier
V3 Companies of Illinois Ltd.
7325 Janes Avenue
Woodridge, IL 60517

Dear Dr. Levernier,

Thank you for depositing in PERC voucher specimen from the Barr Creek Watershed Post-Construction Monitoring Study. The specimens arrived in good condition. I have examined them, and within my own level of expertise, find all of the identifications to be accurate.

We appreciate the deposition of materials here, and look forward to continued cooperation in the future.

Sincerely,



Arwin Provonsha
Curator of Collections



February 21, 2005

Dr. Arwin Provonsha
Department of Entomolgy
901 W. State Street
West Lafayette, IN 47907-2089

Re: Invertebrate Voucher Specimens
Barr Creek, Vanderburgh and Posey Counties, Indiana

Dear Dr. Provonsha:

Enclosed you will find thirty-seven (37) representative macroinvertebrate specimens, in individually labeled vials, and photo-documentation of each. This voucher collection is being submitted to Purdue University Department of Entomology as part of the Barr Creek Watershed Post-Construction Monitoring Study. This project is being done for the Vanderburgh County Soil and Water Conservation District and the Indiana Department of Natural Resources through the Lake and River Enhancement (LARE) program. Please verify these specimens for us.

Please contact me at 630-724-9200 ext. 126, if you have any questions or concerns. Thank you very much.

Very truly yours,
V3 CONSULTANTS, LTD.

Walter Levernier
Ecologist

Edward J Belmonte
Senior Ecologist/Project Manager

WGL/ch

Attachments

cc: Amy Steeples, IDNR
Cecil Rich, IDNR
V3 File



Barr Creek
Post-Construction
Monitoring Study
Photo 1
Vial No. 1

12/7/04

Class: *Hirudinea*

Spring Station 1
Fall Station 1,5



Barr Creek
Post-Construction
Monitoring Study
Photo 2
Vial No. 2

12/7/04

Family: *Tipulidae*

Spring Station 1,2
Fall Station 1



Barr Creek
Post-Construction
Monitoring Study
Photo 3
Vial No. 3

12/7/04

Family: *Gerridae*

Spring Station 1,2
Fall Station 2,4,5



Barr Creek Post-
Construction
Monitoring Study

Photo 4
Vial No. 4

12/7/04

Calipterygidae
Calopteryx sp.

Spring Station 1,5
Fall Station 1



Barr Creek
Post-Construction
Monitoring Study

Photo 5
Vial No. 5

12/7/04

Coenagrionidae Argia
sp.

Spring Station 1,2,3,4
Fall Station 2,4,5



Barr Creek
Post-Construction
Monitoring
Study

Photo 6
Vial No. 6

12/7/04

Family:
Coenagrionidae

Spring Station 1,3,4,5
Fall Station 3,5

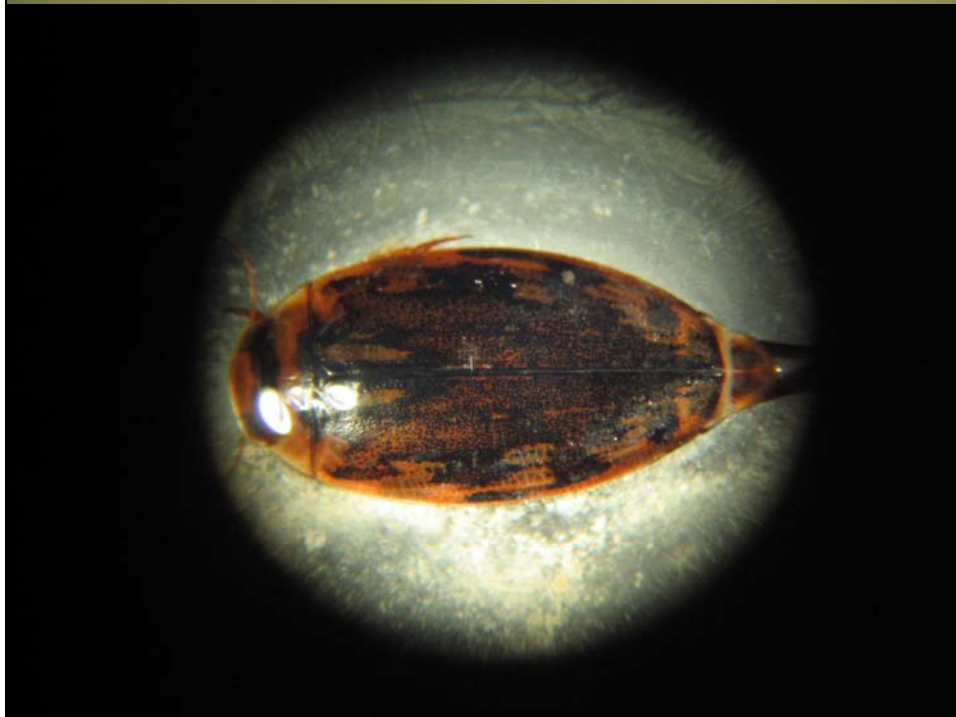


Barr Creek
Post-Construction
Monitoring
Study
Photo 7
Vial No. 7

12/7/04

Hydrophilidae
Tropisternus sp.

Spring Station 1,2
Fall Station 2,3



Barr Creek
Post-Construction
Monitoring
Study
Photo 8
Vial No. 8

12/7/04

Family: *Dytiscidae*

Spring Station 1,3,4
Fall Station 4,5



Barr Creek
Post-Construction
Monitoring
Study
Photo 9
Vial No. 9

12/7/04

Family: *Dytiscidae*

Spring Station 1



Barr Creek
Post-Construction
Monitoring
Study
Photo 10
Vial No. 10

12/7/04

Family: *Simuliidae*

Spring Station 1,2,3,4,5
Fall Station 1



Barr Creek
Post-Construction
Monitoring
Study
Photo 11
Vial No. 11

12/7/04

Family: "Red"
Chironomidae

Spring Station 1,2,3,4,5
Fall Station 1,2,3,4,5



Barr Creek
Post-Construction
Monitoring
Study
Photo 12
Vial No. 12

12/7/04

Family: *Chironomidae*

Spring Station 1,2,3,4,5
Fall Station 1,3,4,5



Barr Creek
Post-Construction
Monitoring
Study
Photo 13
Vial No. 13

12/7/04

Caenidae Caenis sp.

Spring Station 1,2,3,4,5
Fall Station 4,5



Barr Creek
Post-Construction
Monitoring
Study
Photo 14
Vial No. 14

12/7/04

Heptageniidae
Stenacron sp.

Spring Station 1,2,3



Barr Creek
Post-Construction
Monitoring
Study
Photo 15
Vial No. 15

12/7/04

Baetidae Baetis sp.

Spring Station 1,2,4,5
Fall Station 1,2



Barr Creek
Post-Construction
Monitoring
Study
Photo 16
Vial No. 16

12/7/04

Family:
Hydropsychidae

Spring Station 1,4,5
Fall Station 1

Barr Creek
Post-Construction
Monitoring
Study
Photo 17
Vial No. 17

12/7/04

Order: *Amphipoda*

Spring Station 1,2,3,4,5
Fall Station 1,2

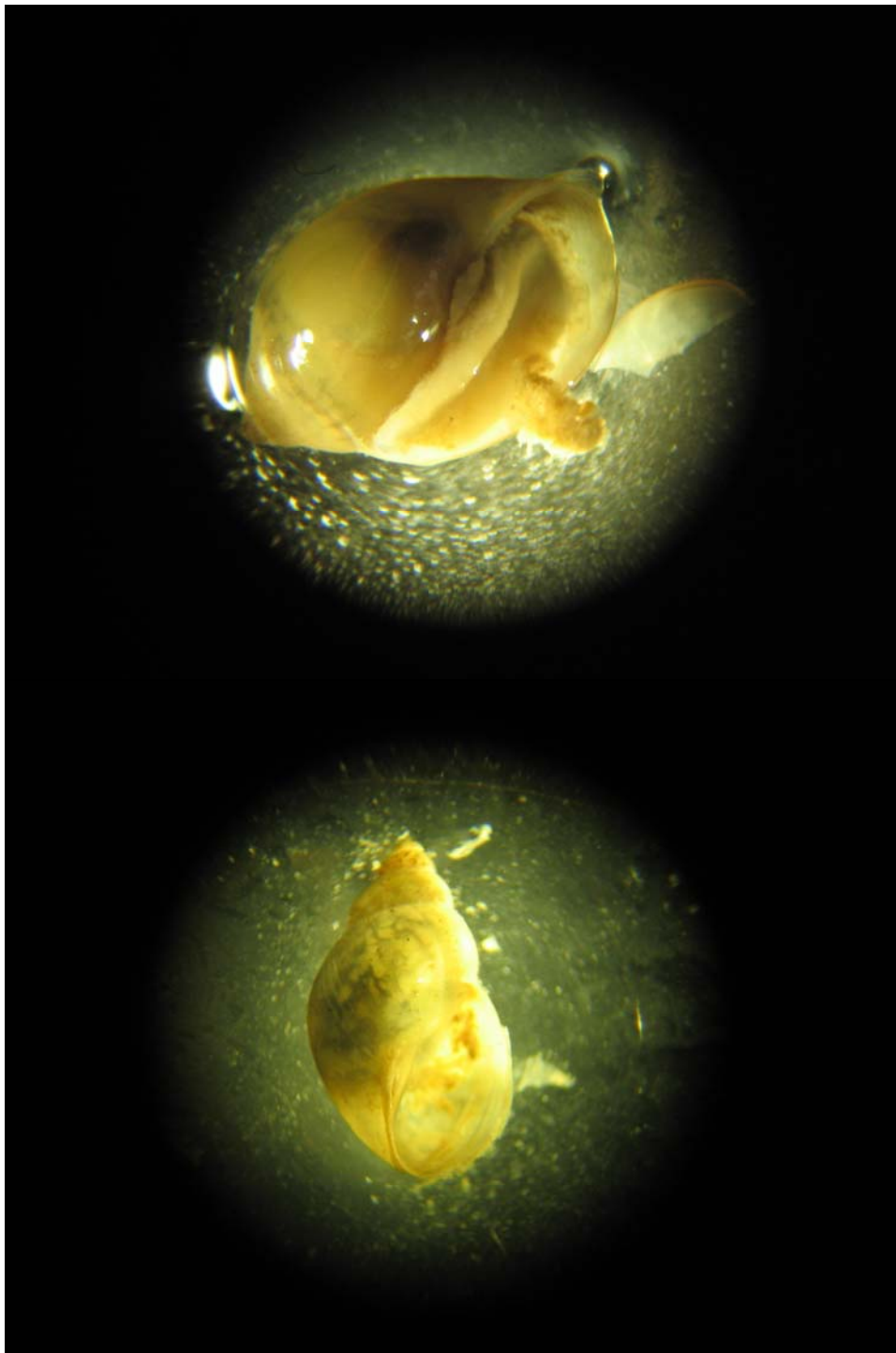


Barr Creek
Post-Construction
Monitoring
Study
Photo 18
Vial No. 18

12/7/04

Family: *Sphaeriidae*

Spring Station 1,2
Fall Station 1



Barr Creek
Post-Construction
Monitoring Study
Photo 19
Vial No. 19

12/7/04

Family: Physidae

Spring Station 1,2,3,4,5
Fall Station 2,3,4,5



Barr Creek
Post-Construction
Monitoring Study
Photo 20
Vial No. 20

12/7/04

Family: *Lymnaeidae*

Spring Station 1
Fall Station 1,4,5

Barr Creek
Post-Construction
Monitoring Study
Photo 21
Vial No. 21

12/10/04

Phylum:
Nematomorpha

Spring Station 2,4,5
Fall Station 3,4,5



Barr Creek
Post-Construction
Monitoring Study
Photo 22
Vial No. 22

12/10/04

Family: *Corduliidae*

Spring Station 2,3,4,5
Fall Station 2,3,4



Barr Creek
Post-Construction
Monitoring Study
Photo 23
Vial No. 23

12/10/04

Class: *Turbellaria*

Spring Station 1,2,4,5
Fall Station 1,3,4,5

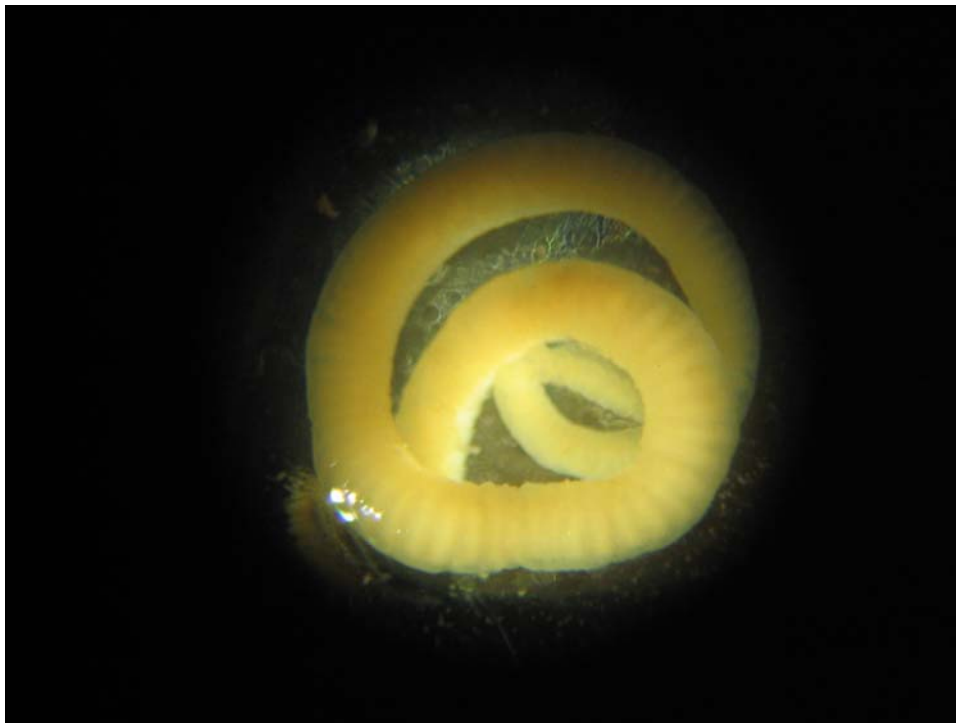


Barr Creek
Post-Construction
Monitoring Study
Photo 24
Vial No. 24

12/10/04

Isopoda Asellidae sp.

Spring Station 2,3,4
Fall Station 1



Barr Creek
Post-Construction
Monitoring Study
Photo 25
Vial No. 25

12/10/04

Class: *Oligochaeta*

Spring Station 1,2,3,4,5
Fall Station 2,4,5



Barr Creek
Post-Construction
Monitoring Study
Photo 26
Vial No. 26

12/10/04

Order: *Decapoda*

Spring Station 2,3



Barr Creek
Post-Construction
Monitoring Study
Photo 27
Vial No. 27

12/10/04

Family: *Haliplidae*

Spring Station 2,3,4
Fall Station 2,3,5



Barr Creek
Post-Construction
Monitoring Study
Photo 28
Vial No. 28

12/10/04

Family: *Elmidae*

Spring Station 2,5
Fall Station 2,3



Barr Creek
Post-Construction
Monitoring Study
Photo 29
Vial No. 29

12/10/04

Family: *Tabanidae*

Spring Station 2,3



Barr Creek
Post-Construction
Monitoring Study
Photo 30
Vial No. 30

12/10/04

Coenagrionidae
Engallagma sp.

Spring Station 3
Fall Station 1,2,5



Barr Creek
Post-Construction
Monitoring Study
Photo 31
Vial No. 31

12/10/04

*Corbiculidae Corbicula
fluminea*

Spring Station 3,4,5
Fall Station 2,4,5



Barr Creek
Post-Construction
Monitoring Study
Photo 32
Vial No. 32

12/13/04

Family: *Elmidae*

Spring Station 5

Barr Creek
Post-Construction
Monitoring Study
Photo 33
Vial No. 33

12/13/04

Family: *Halplidae*

Fall Station 1,2,3,4,5



Barr Creek
Post-Construction
Monitoring Study
Photo 34
Vial No. 34

12/13/04

Family: *Corixidae*

Fall Station 2,3,5



Barr Creek
Post-Construction
Monitoring Study
Photo 35
Vial No. 35

12/13/04

Family: *Culicidae*

Fall Station 2,3,4



Barr Creek
Post-Construction
Monitoring Study
Photo 36
Vial No. 36

12/13/04

Family:
Belostomatidae

Fall Station 5



Barr Creek
Post-Construction
Monitoring Study
Photo 37
Vial No. 37

12/13/04

Family: *Gyrinidae*

Fall Station 5

APPENDIX III:

STATION PHOTOGRAPHS



PHOTO 1

Spring 4/27/04

Station 1
Rush Creek water
quality and
macroinvertebrate
study location. Facing
upstream.



PHOTO 2

Spring 4/27/04

Station 1
Rush Creek water
quality and
macroinvertebrate
study location. Facing
downstream.



PHOTO 3

Spring 4/28/04

Station 2
Barr Creek water
quality and
macroinvertebrate
study location. Facing
upstream.



PHOTO 4

Spring 4/28/04

Station 2
Barr Creek water
quality and
macroinvertebrate
study location. Facing
downstream.



PHOTO 5

Spring 4/29/04

Station 3
Barr Creek water
quality and
macroinvertebrate
study location. Facing
upstream.



PHOTO 6

Spring 4/29/04

Station 3
Barr Creek water
quality and
macroinvertebrate
study location. Facing
downstream.



PHOTO 7

Spring 4/29/04

Station 4
Big Creek water quality
and macroinvertebrate
study location. Facing
upstream.



PHOTO 8

Spring 4/29/04

Station 4
Big Creek water quality
and macroinvertebrate
study location. Facing
downstream.



PHOTO 9

Spring 4/28/04

Station 5
Big Creek water quality
and macroinvertebrate
study location. Facing
upstream.



PHOTO 10

Spring 4/28/04

Station 5
Big Creek water quality
and macroinvertebrate
study location. Facing
downstream.



PHOTO 11

Fall 10/13/04

Station 1
Rush Creek water
quality and
macroinvertebrate
study location. Facing
upstream.



PHOTO 12

Fall 10/13/04

Station 1
Rush Creek water
quality and
macroinvertebrate
study location. Facing
downstream.



PHOTO 13

Fall 10/13/04

Station 2
Barr Creek water
quality and
macroinvertebrate
study location. Facing
upstream.



PHOTO 14

Fall 10/13/04

Station 2
Barr Creek water
quality and
macroinvertebrate
study location. Facing
downstream.



PHOTO 15

Fall 10/13/04

Station 3
Barr Creek water
quality and
macroinvertebrate
study location. Facing
upstream.



PHOTO 16

Fall 10/13/04

Station 3
Barr Creek water
quality and
macroinvertebrate
study location. Facing
downstream.



PHOTO 17

Fall 10/13/04

Station 4
Big Creek water quality
and macroinvertebrate
study location. Facing
upstream.



PHOTO 18

Fall 10/13/04

Station 4
Big Creek water quality
and macroinvertebrate
study location. Facing
downstream.



PHOTO 19

Fall 10/13/04

Station 5
Big Creek water quality
and macroinvertebrate
study location. Facing
upstream.



PHOTO 20

Fall 10/13/04

Station 5
Big Creek water quality
and macroinvertebrate
study location. Facing
downstream.